Biological Assessment
For
Threatened, Endangered, and Proposed Fish Species
That May be Affected by the
Lake Mountain and Middle Tompkins Allotment Management Plan Project

Happy Camp-Oak Knoll and Salmon-Scott River Ranger Districts
Klamath National Forest

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PROJECT NAME: Lake Mountain and Middle Tompkins Allotment Management Plan

ADMINISTRATIVE UNIT: Klamath National Forest, Salmon-Scott River Ranger District

FOURTH FIELD WATERSHED: Scott River
Upper Klamath River

FIFTH FIELD WATERSHED: Lower Scott River
Seiad Creek-Klamath River

SEVENTH FIELD WATERSHED: Deep Creek-Scott River
McCarthy Creek-Scott River
Middle Creek
Tompkins Creek
Rancheria Creek
Tom Martin Creek-Klamath River
Upper Grider Creek

WATERSHED ANALYSES: Lower Scott Ecosystem Analysis (2000)
Thompson/Seiad/Grider Ecosystem Analysis (1999)

NEPA DOCUMENTATION: Lake Mountain and Middle Tompkins Allotment Management Plan Environmental Assessment (in progress)

ESA SPECIES CONSIDERED: Coho salmon (*Oncorhynchus kisutch*)

ESA CRITICAL HABITAT CONSIDERED:
Southern Oregon/Northern California Coasts Coho salmon Critical Habitat (CH)

ESA DETERMINATIONS: May affect, but not likely to adversely affect Southern Oregon/Northern California Coasts Coho salmon ESU; and may affect, but not likely to adversely affect Southern Oregon / Northern California Coasts Coho salmon designated Critical Habitat.

ESSENTIAL FISH HABITAT (EFH): The Lake Mountain and Middle Tompkins Allotment Management Plan may adversely affect EFH for Coho and Chinook salmon, specifically Southern Oregon / Northern California Coasts Coho salmon and Upper Klamath-Trinity Rivers Chinook salmon.

I. Introduction

The purpose of this biological assessment (BA) is to determine effects of the Klamath National Forest's (KNF) Lake Mountain and Middle Tompkins Allotment Management Plan Project (herein after referred to as the Project) on anadromous fish species listed under the Endangered Species Act and on designated Critical Habitat for those species. Also considered are effects on Essential Fish Habitat (EFH) designated under Magnuson-Stevens Fisheries Conservation and Management Act. Species listed as "sensitive" by the Pacific Southwest Region of the USDA Forest Service are analyzed in the Aquatic Resource Report.

The Oak Knoll and Salmon-Scott Ranger District of the Klamath National Forest is proposing to continue to permit grazing on two allotments – Lake Mountain Allotment and Middle Tompkins Allotment. The purpose of this Project is to ensure available forage resources on suitable range throughout both allotments will be properly utilized by permitted domestic livestock. The Project includes the following proposed activities, which are described and analyzed below: an adaptive management process; allotment boundary adjustment; livestock transportation to and from the allotments; livestock grazing within the allotments; allotment monitoring; and exclosure construction at Lookout Spring and Faulkstein Camp Meadow. Grazing is to be reauthorized for a period ten years, at which time allotment permits will again be evaluated again.

This project area encompasses 24,868 acres and straddles the Oak Knoll and Scott River District boundary of the Klamath National Forest west of Scott Bar, California in Siskiyou County in T.44N., R.11W., Sections 3-10, 16-18; T.44N., R.12W., Sections 1,12,13; T.45N., R.11W., Sections 2-5, 8-11, 14-18, 19-23, 26-34; T.45N., R.12W., Section 25, 36; and T.46N., R.11W. Sections 17, 20, 21, 26-29, 32-36 (Mt. Diablo Meridian); 41.9338 Lat, -123.0913 Long DD, NAD 83 Datum). Matrix-General Forest, Riparian Reserve, Late Successional Reserve, Retention and Partial Retention (Visual Quality Objective), and Recreational River land allocations are within the Project boundary, as defined in the KNF's Land Resource and Management Plan (LRMP). Private land accounts for about 473 acres within the project boundary, leaving about 24,395 acres that may be authorized for grazing on National Forest System lands. The 5^{th}-field and 7^{th}-field watershed names and hydrologic unit codes (HUC) where Project activities will occur are:

5th-Field Watersheds	
Lower Scott River	HUC5 - 1801020806
Seiad Creek-Klamath River	HUC5 - 1801020611
7th-Field Watersheds	
Deep Creek-Scott River	HUC 7 - 18010208060402
McCarthy Creek-Scott River	HUC 7 - 18010208060601
Middle Creek	HUC 7 - 18010208060401
Tompkins Creek	HUC 7 - 18010208060403
O'Neil Creek	HUC 7 - 18010206110103
Rancheria Creek	HUC 7 - 18010206110203
Schutts Gulch-Klamath River	HUC 7 - 18010206110104
Tom Martin Creek-Klamath River	HUC 7 - 18010206110101
Upper Grider Creek	HUC 7 - 18010206110201

This BA is prepared in accordance with legal requirements set forth under Section 7 of the Endangered Species Act of 1973, as amended (ESA), [16 U.S.C. 1531 et. seq. 50CFR 402], Essential Fish Habitat (EFH) consultation under 305 (b) (4) (A) of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) and is consistent with standards established in Forest Service Manual direction (FSM 2672.42; USFS 1991). The BA analyzes effects to the following Evolutionary Significant Units (ESUs) and EFH of anadromous fish and their habitat:

Endangered:	None
Threatened:	Southern Oregon / Northern California Coasts ESU Coho salmon (*Oncorhynchus kisutch*) (70 FR 37160, June 28, 2005), and its designated CH (64 FR 24049, May 5, 1999)
Proposed:	None
Candidate:	None
EFH:	Coho salmon Upper Klamath-Trinity Rivers Chinook salmon (*O. tshawytscha*)

APPENDICES: Supporting documents to this BA are located in the following appendices:

- Appendix A: Maps showing location of Project activities and Pacific salmonid distribution
- Appendix B: Brief Description of Concentrated Use Areas
- Appendix C: Table of Population and Habitat Indicators
- Appendix D: Environmental Baseline and Proposed Action Effects Checklist
- Appendix E: Best Management Practices
- Appendix F: Life History and Biological Requirements of Pacific Salmonids

II. Consultation to Date

A list of Threatened, Endangered, and Candidate species was obtained online from the Arcata FWS office website on April 18, 2014 (FWS 2014). This list was used as a basis for determining which fish species were to be considered in this biological assessment.

The Project has been discussed with a NMFS representative (D. Flickinger) at Level 1 meetings on 10/11/12, 1/7/14, and 4/24/14. A Project Initiation Form was sent to D. Flickinger on 4/18/14, thereby providing NMFS with a project description, map, and anticipated timeline for BA submission. A visit to the Middle Tompkins allotment occurred on 5/1/14 to discuss different aspects of the project. A draft BA was sent to D. Flickinger on 5/12/14. Comments were received on 7/27/14 and edits subsequently completed. A second draft was submitted on 11/24/14, with comments received on 12/14/14 and edits completed thereafter. The BA was finalized on 1/9/15.

The Middle Tompkins Allotment was initially included within 1996 consultation for permit issuance for multiple allotments on the west side of the Klamath National Forest (USFS 1996). The determination was "May Affect, but is Not Likely to Adversely Affect, and Will Not Jeopardize the Continued Existence" of Coho, Chinook, and steelhead (Coho was in proposed status at the time). Multiple concerns were subsequently expressed by NMFS; and in response, a second BA was completed in 1997 (USFS 1997a). Due to potential overlap of grazing with anadromous habitat, and uncertainties concerning actual use and impact to fish, the determination for Middle Tompkins Allotment was "May Effect, Likely to Adversely Affect." Within the 1997 BA, the statement was made that updates would occur as site specific information could be collected to address specific concerns or data gaps.

Following the 1997 Biological Opinion (NMFS 1997), several actions were completed to minimize and monitor grazing along Tompkins Creek, the only anadromous stream within the Middle Tompkins allotment potentially accessible by cattle. In 1999, a cattleguard was installed on Forest Road 45N65 to prevent livestock from using the road to access the creek after turnout on the east side of the allotment (USFS 1998, 1999a). Additionally, a monitoring strategy for Middle Tompkins Allotment was developed (USFS 1999b). A photo point was established downslope of the holding corral where it was most likely for animals to access the riparian and stream area, with photos taken from 1998 through 2013. Monitoring reports were submitted to NMFS 1998 through 2008, noting that there was no grazing use along the anadromous portion of Tompkins Creek due to lack of desirable forage (USFS 2009).

A field review of two representative allotments from the 1997 BA – Horse Creek and Seiad-Johnny – was conducted by the KNF and NMFS in October 1999 (USFS 2001). The team agreed that adverse effects to listed anadromous fish were likely not occurring. Furthermore, monitoring during 1997 to 2000 indicated that potential livestock-related impacts to anadromous fish in these areas was negligible. The KNF planned to submit a proposal to reinitiate consultation on several grazing allotments where livestock use patterns and anadromous fish habitat did not overlap, including Middle Tompkins, with the aim to revise effects determination from "May Effect, Likely to Adversely Affect" to "May Affect, But Not Likely to Adversely Affect". However, the proposal was never finalized.

III. Proposed Action

The Klamath National Forest proposes to continue to permit livestock grazing on two allotments on the Oak Knoll and Scott River Ranger Districts: Lake Mountain and Middle Tompkins Allotments. Grazing is to be reauthorized for a period ten years, at which time allotment permits will be evaluated again. Therefore, the time period covered by this BA is ten years and can be extended if conditons are similar. As appropriate, the allotments have been divided into pasture units so as to better facilitate management. Forage areas for livestock are generally located in meadows, open ridges, and as patches within forest mosaic, including openings created during past logging operations. The remainder of this section summarizes Project activities. Overview maps of the Project area are available in **Appendix A**. A summary of allotment size, permitted animal use, and season of use is provided in **Table 1**.

Table 1. Acreage, pasture units, HMs and on/off dates by allotment.

Allotment	Acres	Units (Pastures)	Maximum Permitted Head Month (HM[1])	On-Off Dates[2]
Lake Mountain	5,323	Lake Mountain	76	July 1 to October 31
Middle Tompkins	16,772	Eagle Springs, Middle Creek, Tompkins, Tyler	250	May 5 to October 15

[1]Number of cow/calf pairs multiplied by months of grazing
[2]On-dates based on range readiness, previous management results, and/or other constraints; and off-dates based on forage utilization. These are not actual on-off dates, but represent the earliest and latest dates livestock are allowed on the allotment. Actual season of use is expected to be less.

Description of the proposed action is divided into smaller elements so as to better describe the overall Project and potential effects on Coho Salmon and their Critical Habitat. All interrelated and interdependent actions have been considered. These project elements include:

- Adaptive management process
- Allotment boundary adjustments
- Livestock transportation to and from the allotments
- Livestock grazing within the allotments
- Allotment monitoring
- Proposed exclosure fencing at Lookout Spring and Faulkstein Camp Meadow, as well as additional structures (*e.g.*, drift fences, corrals, water improvements, and salt blocks) which have been pre-identified as options under the adaptive management process

Adaptive Management Process

The Project will implement and monitor adaptive management strategies in order to ensure that livestock grazing allows desired resource conditions in the action area to be maintained or improved over time. Utilizing adaptive strategies is an effective way to manage rangeland because it is objective-oriented and allows the manager to choose from a suite of management actions in order to achieve desired resource conditions in the face of changing climatic and vegetation conditions. **Table 2** summarizes the Klamath Land and Resource Management Plan (LRMP) desired resource conditions, as they relate to salmonids and aquatic ecosystems. The LRMP direction facilitates an integration of resource outputs that is consistent with multiple use and sustained yield principles. By applying these standards, no resource output can be emphasized to the exclusion of another. These conditions are the objectives that drive the design and implementation of adaptive management strategies utilized for the Project.

Table 2. Klamath LRMP desired resource conditions by ecological community type.

Vegetation Community Type	Desired Resource Conditions or LRMP Objective
Upland	Healthy and resilient rangeland ecosystems provide sustainable forage for use by livestock, wildlife, and wild horses. There is a mosaic of cover and forage habitat available, and a variety of browse age and size classes. Summer and spring game forage is available (approx. 55% forbs and 45% grasses). Productive forest soils continue to provide the medium for the ecosystem
Wet Meadow	In wet meadows the water table is near the meadow surface (within 2 feet) with the stream meandering through the meadow. Overhanging banks with herbaceous and/or woody vegetation provide canopy cover. Few signs of gullying are apparent. Domestic livestock use meadows and streamsides, but do not degrade the systems.
Riparian	Conditions and trends are consistent with Aquatic Conservation Strategy goals. Vegetative communities contain native and desirable non-native species that are in good ecological condition. On the ground a mixture of shrub, grass, forb, and sedge provides for bank stability and integrity, sediment filtering and habitat characteristics necessary for riparian dependent species. The riparian plant community includes all ages and sizes. Riparian vegetation is diverse and dense enough that it stabilizes the stream banks. The stream maintains itself through normal channel processes with few signs of management improvements.
Aquatic	High quality aquatic habitat is capable of supporting abundant populations of anadromous and resident fish and other aquatic species. These ecosystems are healthy and resilient to change.

Specific management actions may include, but are not limited to: adjusting stocking rates; moving salt locations; changing season of use or timing when livestock enter a specific area; changing utilization or stubble height standards; resting an allotment, pasture within an allotment, or specific location, such as a meadow or riparian area; and changing grazing system (e.g., deferred rotation, rest-rotation, short duration/high intensity, etc.). More aggressive management options involve structures (developing water sources, fencing, placement of onsite woody debris in stream channels), utilizing range riders, modifying animal class (e.g., yearlings instead of cow/calf pairs), and culling problem animals. If an allotment, or unit, is not meeting or trending towards desired resource conditions, and management actions are not effective in reaching desired conditions, then the KNF will prepare a new proposed action for the allotment(s) and reinitiate consultation.

During the grazing season permittees manage livestock in compliance with the terms explicit in their allotment permit, Allotment Management Plan (AMP), and current Annual Operating Instructions (AOI) (referred together as "permit"). Terms of the permit require that the units of an allotment meet specified forage utilization, ground cover, and streambank disturbance minimization standards. The permit also includes adaptive management actions and desired resource objectives and conditions applicable for a given allotment. KNF Range personnel meet with permittees prior to the grazing season to ensure understanding of responsibilities and obligations under the permit, as well as to discuss grazing season schedule for the upcoming year, past year monitoring results, and any other pertinent information. Forage and other standards are monitored formally by the KNF at the end of the grazing season, as well as during mid-season spot checks when possible. Also, the maintenance of any rangeland improvement structures such as drift fences, water developments, and corrals is included in the permits. Failure to meet terms of the permit results in changes to the permit, implementation of the appropriate adaptive management strategy, or even potential loss of the permit, using the processes defined by the permit administration program.

Allotment Boundary Adjustment

Boundaries for both Lake Mountain and Middle Tompkins allotments will be adjusted by the Project to reflect on-the-ground usage and management history, as well as currently proposed grazing practices.

Lake Mountain – Allotment area would decrease from 9,657 acres to 5,323 acres, with the northern boundary shifting south (**Map A-1**). Historically, the northern portion of the allotment was utilized as early summer range. However, due to changes in livestock management over the decades, on-dates for the allotment have shifted to later in the season, at which time already widely scattered forage pockets are either no longer available or else are of low quality. Additionally, livestock are transported to pasture in a different manner than in the past, and initially distributed in a different location. Therefore, because the northern portion of the allotment is no longer utilized by cattle due to forage timing, changes in allotment management, steep and inaccessible terrain, and other considerations, allotment boundaries are to be adjusted to reflect actual livestock usage.

Middle Tompkins – Allotment area would increase from 14,738 acres to 16,722 acres (**Map A-2**). Ridgeline forage areas on the west and east side of the allotment, including several Grider Creek headwaters streams, would be included in the allotment; and the Deep Creek watershed on the southern end, which is not utilized by cattle, would be removed.

Realignment of allotment boundaries to reflect actual livestock distribution and usage will rectify an error which appears to originate from 1995. In that year, allotment boundaries were transferred from paper to electronic format; and in doing so, the western boundary of Middle Tompkins allotment was set to the Scott River District boundary. Due to a lack of topographic control features and a situation where it was prohibitively expensive to build and maintain a ridgeline fence, Faulkstein Camp Meadow, Tyler Meadows, and surrounding locales have historically been included in the Middle Tompkins allotment. While an Environmental Assessment for grazing in 1996 utilized the new GIS boundary, hand-drawn maps included with AOIs to the permittee encompassed pre-1995 use areas. Furthermore, subsequent AOIs also included these meadows, and visits to an existing monitoring site in Tyler Meadows continued. Historically, these meadows have been grazed under one allotment management unit or another since the 1920s.

Livestock Transportation To and From Allotments

Below is a description of how cattle are typically brought into and out of the Project allotments each year.

Lake Mountain – Once rangelands are determined to be ready, cattle are hauled by cattle/horse trailers to the ridge between East Walker Creek and O'Neil Creek and distributed into nearby forage pockets. Due to the small number of permitted animals, this is usually accomplished in one or two days. At the end of the permitted grazing season, livestock are gathered to the Kuntz Corral and hauled by cattle/horse trailers from the allotment to off-Forest pasture.

Middle Tompkins – Once rangelands are determined to be ready, cattle are hauled by cattle/horse trailers truck to the Tompkins Creek Corral. Transportation is usually accomplished in a couple of days. Livestock are then walked up Forest Roads 46N64 and 45N65, past the cattle guard, and up onto the ridgeline slopes between Tompkins Creek, Townsend Gulch, and McCarthy Creek on the east side of the allotment. At the end of the permitted season, livestock are at the south and southwest side of the allotment, including the slopes above Middle Creek. Cattle are gathered and walked in small groups along Forest Road 46N64 back to the Tompkins Creek Corral, where they are hauled off the allotment by cattle/horse trailer to off-Forest pasture.

Livestock Grazing in Allotments

After reaching the forage areas of the allotments, livestock generally graze in small herds, spreading out more individually in forested areas that contain a sparse and distributed forage base. Within Project allotments, livestock activity areas have been divided into "capable", "moderate use", and "high use" (**Table 3**; **Maps A-5, A-6**). Capability relative to grazing is defined as lands accessible to livestock, producing forage or having inherent forage producing capability, and able to withstand grazing on a sustained basis under reasonable management practices. See the "Rangeland Resource Report" for additional details (USFS 2014a). In general, lands considered capable are less than two miles from accessible water, less than 40% slope, and have the potential to produce forage (i.e., are not roads, barren rock, etc.). Capability is determined via GIS mapping, and as such is an approximation because seasonal changes in forage and water may limit when capable areas are available. "Moderate use" and "high use" are subsets of capability, areas of known livestock concentration. For Project allotments, most locales of higher utilization occur on relatively flat (less than 5%) wet or dry meadows in stream headwater areas.

Most streams of the action area are, in practice, inaccessible to cattle due to steep topography and difficult footing. There are few wet meadows, and many of these areas do not have defined stream channels, only high water tables. Therefore, cattle primarily access streams in low-gradient wet meadows such as the headwaters of Fish Creek, Rancheria Creek, and Tyler Meadows Creek. Pastures that receive the most use by cattle, and contain low gradient streams are called **aquatic emphasis areas** for the purpose of this analysis because these are the locations where potential aquatic impacts from the Project are expected to originate. Emphasis areas typically contain all the habitat elements cattle prefer such as forage, resting places, and water. **Table 6** lists Project emphasis areas, which are the meadows and areas that receive medium or high levels of grazing <u>and</u> contain cattle-accessible stream channels. Emphasis areas, and how they were identified, are discussed in the "Existing Environment and Effects to Anadromous Fish and Their Habitat Indicators" section.

Range improvement structures are used to help direct and distribute livestock grazing. Drift fences, corrals, water improvements, and salt blocks may be utilized. The use and maintenance of structures and salting is defined in specific AMPs. Each Project allotment has several salt block locations that are typically supplied during the grazing season. Salt is placed in areas where cattle do not naturally congregate and helps to distribute forage use and soil compaction. Salt is typically placed at least 200 feet from water and not placed in wet meadows, trails, or shade-up areas. Cattle acquire water from wet vegetation, standing water, springs, and accessible streams. Water sources have been developed, such as spring-fed troughs, are described in AMPs. Additional improvements planned for this Project, as well as structure options which may be necessary given the adaptive management strategy, are described in greater depth later in this project description.

Table 3. Capable, moderate use, and high use acres for existing condition and proposed action by allotment. Allotments have further been divided by 7th-field watershed.

7th-Field Watershed	Watershed Acres	Existing Condition				Proposed Action			
		FS Allotment Acres in Watershed[1]	Capable Acres[1]	Moderate Use Acres	High Use Acres	FS Allotment Acres in Watershed[1]	Capable Acres[1]	Moderate Use Acres	High Use Acres
Lake Mountain Allotment									
O'Neil Creek	2429	2420	600	0	0	740	240	0	0
Tom Martin--Klamath River	10690	5830	1560	175	12	4590	1250	175	12
Schutts Gulch-Klamath River	6692	1340	180	0	0	0	0	0	0
Total			2340	175	12		1490	175	12
Middle Tompkins Allotment[2]									
Deep Creek-Scott River	3798	640	70	0	0	260	20	0	0
McCarthy Creek-Scott River	11680	630	120	0	0	800	200	6	0
Middle Creek	4498	4270	960	6	17	4270	960	6	17
Rancheria Creek	4374	0	0	0	0	1870	570	29	0
Tompkins Creek	9327	9260	1770	49	0	9260	1770	49	0
Upper Grider Creek	8467	0	0	0	0	330	310	31	13
Total			2920	55	17		3830	121	30

[1]Totals include rounding of GIS-estimated acreage calculations

[2]Adjustments to allotment boundary reflect established on-ground use patterns, and does not denote new use. See "Allotment Boundary Adjustment" in project description for additional information.

Below is a description of how cattle typically distribute within and move throughout Project allotments. In response to monitoring and implementation of adaptive management, livestock movement patterns have the potential to change over the lifetime of the Allotment Plan. Nevertheless, the description below is a best approximation of expected livestock movement and distribution during the Project.

Lake Mountain – Over the course of the grazing season, livestock slowly drift from their turnout location to higher elevation, generally by traveling on roads. Cattle spread out and distribute amid the forage areas on the north side of the ridgeline (south end of the allotment) between Lake Mountain and Tom Martin Peak, with the headwater areas of Kuntz Creek, Mill Creek, and Macks Creek tending to have the most use. Salting and herding are used throughout the grazing season to distribute livestock through the allotment, although cattle are inclined to concentrate near the Kuntz Creek area. Access to the northern part of the allotment, closer to the mainstem Klamath River, is limited due to steep and inaccessible terrain, lack of roads, and lack of forage and water.

Middle Tompkins – From the Tompkins Creek Corral, livestock are initially walked up Forest Roads 46N64 and 45N65, past the cattle guard, and up onto the ridgeline slopes between Tompkins Creek, Townsend Gulch, and McCarthy Creek on the east side of the allotment. As forage and water sources dry on the east side of the allotment, livestock are gathered and actively moved south along the road system, over Tompkins Creek via a bridge on 46N64, and up the ridge towards Middle Creek. This process may take several days and is dependent upon size of groups found by the permittee. Once animals are in motion towards the other side of the allotment, transiting each group requires less than a day; and due to the relatively short distance, cattle are not allowed to stop for forage or water. Cattle are redistributed in the forage pockets at and near Middle Creek Meadow. By mid-season, most cattle are expected to be utilizing the meadows on the west side of the allotment, although the Tyler Meadows and Faulkstein Camp Meadow areas are not to be entered before July 1st so as to provide time for plants to mature and soils to dry. By the end of the season, livestock may be scattered throughout the west to south side of the allotment. Access into Grider Creek, the bottom of Middle Creek, and the southern slopes of Middle Creek is restricted due to steep terrain, lack of roads, and lack of forage and water. Cattle are gathered at the end of the permitted season and walked in small groups along the road system back to the Tompkins Creek Corral.

Due to the presence of anadromous fish habitat, Tompkins Creek is of particular interest when livestock are being actively moved within the Middle Tompkins allotment. Steep slopes constrain animals to the roadbed, preventing them accessing water or the riparian area. A point of potential access is at the Forest Road 46N64 crossing, when livestock are being moved to the south side of the allotment. As mentioned above, animals are typically not allowed to stop at the crossing. So as to accommodate potential fisheries concerns, this informal practice is to be included within the reauthorized permit and AOIs, officially prohibiting livestock from stopping to water or forage within the anadromous reach of Tompkins Creek (McMorris, pers. comm.).

Past permittees have encountered difficulty in keeping livestock from crossing the ridgeline between Middle Tompkins Allotment to Lake Mountain Allotment, particularly if animals on the east side of the allotment are not moved prior to seasonal forage decline. Strategically placed take-down drift fence has not been effective and the installation of a permanent fence has been deemed cost prohibitive to build and maintain due to terrain and weather. An Adaptive Management System for herd management will be implemented within the framework of the permit to minimize cross-allotment drift. Salting, active herding, altering animal class (e.g., heifers instead of cow/calf pairs), and culling of persistent problem animals are examples of options which may be considered, with the goal to distribute cattle more evenly across the pasture units.

Transportation and Livestock Grazing – Single Permittee Variation

Due to the vacant status of the Middle Tompkins allotment, it is highly likely, although not certain at the time of this document, that the current Lake Mountain permittee will also take management of Middle Tompkins. If this event occurs, the permittee plans to manage the two allotments in a complementary fashion, with a high likelihood of modifications to past/current transportation and herd management. Subsequent analysis of effects does not rely upon the single permitted variation occurring, and is included as additional background information for the Project description. If the single permittee variation does happen, effect to Coho salmon and Critical Habitat will be similar to, or less than, that analyzed in the remainder of this document.

As on-dates (i.e., July 1) and range conditions allow on the Middle Tompkins allotment, cattle which are eventually destined to Lake Mountain will be hauled to the Tompkins Creek Corral. These animals will be herded to the east side of the Middle Tompkins allotment, as described previously. When access is authorized into Lake Mountain allotment, these animals will be walked along roads and over the ridge to grazing areas in the vicinity of Brown Knob and Macks Creek headwaters. At the end of the season, the Lake Mountain herd will be gathered to the Kuntz Corral and removed.

Once Lake Mountain cattle have been moved to their allotment, additional livestock will be brought to the Tompkins Creek Corral to utilize the Middle Tompkins allotment. Number of animals and length of grazing season will be calculated based upon HMs remaining to the allotment after use by the Lake Mountain herd, with total HM not to exceed the 250 HM allowance. Livestock will be herded directly from the corral to the south and southwest side of the allotment, where they are expected to move as normal. Gathering and transportation at the end of the season from the allotment will occur as previously described. The permittee may also opt to transport Middle Tompkins animals directly to and from the Middle Meadows area, thus eliminating the crossing of Tompkins Creek and the need to herd animals along the road system.

<u>*Monitoring*</u>

Within the Project allotments, several **key areas** have been identified by range staff as monitoring locations (**Maps A-1, A-2**). <u>Key areas</u> are different from the prior labeled <u>aquatic emphasis areas</u>. While key areas and aquatic emphasis areas may overlap in regards to concentrated use (see **Appendix B**), the former may also be located in association with mesic or dry meadows, seeps/springs, swales, or ill-defined intermittent/ephemeral channels so as to track grazing use in locales not necessarily directly connected to the aquatic environment. The characteristics of a range key area include location within a single ecological site or plant community, be responsive to management actions, and be indicative of the ecological site or plant community they are intended to represent.

- Lake Mountain – 1 key area
    - Headwater meadow of Kuntz Creek off Forest Road 46N45. If grazing intensity appears to be greater than normal, monitoring efforts may be shifted to the west side of the meadow at Lookout Spring, which historically shows higher utilization.
- Middle Tompkins – 2 key areas; 1 alternate
    - Middle Creek Meadow is a spring/swale meadow on the ridgeline above Middle Creek, off of Forest Road 46N64. This is area has a history of chronic high utilization.
    - Tyler Meadows includes a single large meadow, as well as a series of stringer meadows, with an alder/willow component and a perennial stream channel in the headwaters of Tyler Meadow Creek, off of Forest Road 45N77. This area has a history of chronic high utilization.
    - Townsend Meadow (alternate) is a mesic meadow with a small seep on the ridge between Tompkins Creek and Townsend Gulch, draining towards the former, off of Forest Road 45N65. While it has not been regularly used for monitoring in the past, it has been identified by range personnel as a locale to establish a key area on the east side of the allotment should need arise.

To track the results of livestock management decisions within Project allotments, both annual and long-term (effectiveness) monitoring is to be utilized. Additional discussion on key areas, as well as details on specific monitoring protocols, can be found in the Project record within the "Rangeland Specialist Report" (USFS 2014a) and other documents. This Biological Assessment only briefly comments upon each methodology.

Annual - Annual monitoring comprises range readiness, as well as during and post-season utilization. The purpose of annual monitoring is to track range utilization in a given year and to ensure AOI prescriptions are being followed such that long-term goals related to plant community and landscape condition can be met.

Inspections of range readiness are performed on each allotment by KNF range personnel to determine when grazing may begin. Range readiness defines the time in the plant growth cycle when initiation of grazing will not cause permanent damage to vegetation and soil. The KNF uses specific range readiness phenology (plant development) standards by dominant forage species as described in Wood, *et al*. (1960), USDA (1969), and Rangeland Analysis and Planning Guide (USFS 1997b), and these standards are explicit in all grazing standards. Soil moisture level, annual climate variation, and forage utilization from the previous season are also considered.

Permittees are responsible for monitoring forage utilization in the allotments throughout the grazing season, and KNF range personnel complete a formal utilization inspection near the end of the grazing season. KNF personnel may also perform spot checks of vegetation condition and animal distribution during the grazing season. Forage utilization levels are specified clearly in AMPs and AOIs and permittees are educated about the consequences of not meeting these standards. **Table 4** lists utilization standards by vegetation type. Utilization is guided by the KNF LRMP (see "Rangeland Specialist Report" (2014a) for additional details). These standards serve as triggers for changes in same-year or next-year management, as applicable, if monitoring shows they have been exceeded.

Finally, photographs are taken during range readiness and at end-season utilization review. Therefore, each key area, at a minimum, has two photos associated with it each year. In addition to serving as a visual representation of pre- and post-grazing season range conditions, they can be used as longer-term site documentation.

Table 4. Percent allowable utilization levels by ecological condition.

Ecological Condition	Upland	Wet Meadow	Riparian
Satisfactory	40-55%	45-60%[1] 3 to 4 inches[2]	40-50%[1] 3 to 4 inches[2]
Unsatisfactory	25-35%	25-40% 4 to 5 inches	20-30% 4 to 5 inches
Utilization levels of woody vegetation	45-55%	45-55%	35-50%

[1]This first number represents the percentage of the current year's growth that is acceptable to be removed during single grazing year (utilization level).
[2]This second number represents the approximate (stubble) height of vegetation that will remain on the site after the end of the grazing season. This figure is an estimate, based on a general knowledge of the herbaceous species that occupy these types of sites within the Klamath Province. These figures must be refined based on species composition and growing conditions.

Long-term (Effectiveness) – Long-term monitoring within the Project allotments utilizes rooted frequency plots, the Best Management Practice Evaluation Program (BMPEP), and Proper Functioning Condition (PFC). Purpose of this monitoring is to track multi-year cumulative effect of livestock management. Both the plant community and the physical environment (e.g., stream channel morphology, ground compaction) may require years to decades to show a response (positive and/or negative) to management changes. All long-term monitoring described below occurs at a minimum every 5 years, although at the discretion of KNF range personnel it can be performed more often, if necessary. The monitoring schedule is staggered such that only one protocol of the three listed may be completed in a given year; and some years may see no long-term monitoring in a Project allotment (although annual monitoring will always be done).

Rooted frequency plots determine meadow species composition within standardized quadrat frames. Frequency is based upon presence or absence of a plant species in a given number of repeatedly placed quadrats. Soil attributes are also included for the final estimation of ecological condition.

The USFS Region 5 Best Management Practices Evaluation Program (BMPEP) is used to monitor the aquatic/riparian ecological conditions in allotments and the effectiveness of Project BMPs. Best Management Practices specific to the Project are listed in **Appendix E**. The BMPEP grazing protocol records herbaceous and woody utilization levels, streambank disturbance, ground cover, bank angle, riparian and upslope erosion, and riparian vegetation and seral condition information.

Proper Functioning Condition (PFC) is a qualitative method for assessing the condition of riparian-wetland areas. It is used as a starting point for determining and prioritizing the type and location of quantitative inventory or monitoring necessary. The assessment is a checklist approach designed to be used by an interdisciplinary team. Elements of hydrology, vegetation, and soils (erosion/deposition) are considered in the checklist.

Triggers have been established in regards to long-term monitoring. If one or more of these trigger conditions are observed, then management strategies will be changed to allow recovery.

- Rooted frequency plots show a downward trend.
- BMPEP monitoring outputs as "less than effective".
- Proper Functioning Condition is "functional-at-risk".

Recent monitoring data show allotments to be in satisfactory condition (USFS 2014a). A localized exception is Lookout Spring in the Lake Mountain Allotment; and proposed protection actions at the spring are expected to lead to an improved condition (more below). If one of the above conditions are triggered, then an appropriate adaptive management action will occur. As necessary, site-specific, in-depth monitoring may be initiated to track the issue of concern. For instance, if chronic overutilization of browse was found to be a problem, then the appropriate monitoring protocol would be applied to track subsequent results of changes in management.

Lookout Spring, Faulkstein Camp Meadow, and Other Improvements
The Project proposes two range improvements. The redevelopment of Lookout Spring will manage a site of known chronic over-utilization by livestock, and the Faulkstein Camp Meadow headcut exclosure will minimize impact of cattle upon an existing headcut. Other structural improvements within the Project allotments are dependent upon livestock distribution, movement, and forage use; and specifics may not be developed until and unless detrimental impact to sensitive resources is observed. Except for Lookout Spring and Faulkstein Camp Meadow, impacts to these supplementary actions cannot therefore be determined as no details are known, and need may not materialize. If future actions proposed in response to adaptive management may result in impacts to listed species and/or habitat, they will be analyzed and consulted upon at that time. For this document, only a list of potential actions is provided.

Lookout Spring Redevelopment – "Lookout Spring" is an unnamed spring within Lake Mountain allotment, north of Lake Mountain Lookout approximately 0.3 miles. From the east side of the ridge, it drains towards Kuntz Creek and is a component of the Kuntz Creek headwater meadow. The presence of an old springbox indicates it was improved in the past for human and/or livestock use. The Project proposes redevelopment of Lookout Spring with construction of a half-acre livestock exclosure around springhead and seep. The exclosure fence would be built in a "take down" style and be constructed with wire, wood posts, and T-posts. The trough would be made of durable plastic with a capacity of 100 gallons or less. Water which overtops the trough would flow back into the spring system. All construction work would be accomplished by hand.

Faulkstein Camp Meadow Headcut Exclosure – "Faulkstein Camp Meadow" is a small unnamed meadow area in the headwaters of Grider Creek within the Middle Tompkins allotment. It has historically exhibited moderate livestock use. A headcut is present in the meadow. Although agent of origin for the headcut is not apparent, it is not believed to have been caused by livestock. However, livestock do have the potential to impact the headcut via foraging in its vicinity and trampling adjacent streambanks, thereby causing it to move faster than might otherwise be expected. To minimize the impact of livestock upon the headcut, an exclosure fence will be built. The fence will be placed around the headcut so that cattle do not access the unstable area. A split-rail, zig-zag, or similar style fence will be manually constructed using logs approximately 10-inch diameter. There will be no ground disturbance because the fence will be set upon the surface of the meadow. Repairing the headcut is beyond the scope of this project, but the fence will prevent livestock from intensifying the existing erosion.

Other potential actions which could occur as a result of adaptive management include:

- Rebuilding of the exclosure (wire) fence around Middle Creek meadow.
- Installing a fence around Tyler Creek meadows. May be temporary electric fencing or permanent wire fence.
- Develop upland water sources at Rancheria Spring (T.45N., R.12W., SE ¼ of Section 13) Yellowjacket Spring (T.45N., R.11W., S ½ of Section 19), and/or unnamed tributary of Tompkins Creek (T.45N., R.11W., S ½ of Section 31).
- Install cattle guards and short (0.5 mile or less) drift fences

As mentioned above, if any future actions proposed in response to adaptive management result in impacts to listed species and/or habitat, they will be analyzed and consulted on at that time.

IV. Description of Action Area, Affected Species, Critical Habitat, Essential Fish Habitat

Action Area: The Action Area is defined for ESA purposes as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 402). The Action Area for this BA is where Project Elements (PEs) are occurring, as described in **Table 3**, **Table 7**, and **Appendix A** and the subdrainage habitat downstream to, and including, subdrainage confluence zones with Grider Creek, Scott River, and Klamath River. The general area and waterways affected are expanded upon in the next subsection. In summary, Project activities are located within nine 7th-field subwatersheds, which in turn are located within two 5th-field watershed on the Scott River and Oak Knoll Ranger Districts. The primary anadromous subdrainages where Project activities will within the allotment boundary area occur include O'Neil Creek, Rancheria Creek, and Tompkins Creek.

Presence of anadromous salmonids and Coho CH: The distribution of anadromous fish, including SONCC Coho salmon, within and near the Project, as well as CH and EFH extent, is shown in **Appendix A**. The status and general life history of anadromous salmonids potentially affected by the proposed action is in **Appendix F**. Conclusions regarding anadromous fish and habitat (including CH/EFH) occurrence are based on field review of habitat suitability, professional judgment, District fish survey records, and California Department of Fish and Wildlife (CDFW) data. Additional information on how CH/EFH was determined for the Project is found in **Appendix F**.

In summary for the Project:

- Coho – Confirmed presence in O'Neil Creek, Tompkins Creek, Grider Creek, Scott River, and Klamath River.
- CH/EFH – O'Neil Creek, Tompkins Creek, Grider Creek, Scott River, and Klamath River.
    - CH/EFH distribution will be defined by known Coho distribution within the Project area, and not a (steelhead) anadromy surrogate, due to an extensive history of Coho and Chinook surveys, as well as knowledge of local barriers to these species.

V. Existing Environment and Effects to Anadromous Fish and Their Habitat Indicators

General Area Description

The Lake Mountain and Middle Tompkins Allotment Management Plan Project is located largely within drainages east and south of Lake Mountain lookout; and west and southwest of the community of Scott Bar, CA. The Lake Mountain Allotment encompasses several small fish and fishless drainages to the Klamath River. Within the Middle Tompkins Allotment, Tompkins Creek and Middle Creek are the primary watersheds, although there are small headwater inclusions of streams which drain west towards Grider Creek. Project elevation is approximately 2,000 to 6,800 feet.

Tompkins Creek is a third-order perennial of the Scott River. Flowing south, it drains the western flanks of Tom Martin Peak, the south side of Lake Mountain Peak, and much of the east side of the ridge south of Lake Mountain Peak to the Tyler Meadows area. Except for the Scott River Lodge at the mouth, ownership within the Tompkins Creek drainage is Forest Service. While Tompkins Creek has several perennial branches, as well as large intermittent tributaries, none are named. Past and present influences within the drainage include timber harvests, roads, grazing, mining, water diversion, wildfire, and flood. Coho, steelhead, and rainbow trout are present in the creek, with the upstream limits of each species (e.g., approx. three miles upstream from the mouth for SONCC Coho salmon) restricted by gradient, discharge, stream size, and/or barriers.

Middle Creek is a second-order perennial of the Scott River. Flowing east, it drains the unnamed ridges and peaks between Tyler Meadows and the Marble Mountain Wilderness. Past and present influences within the drainage include timber harvests, roads, grazing, mining, wildfire, and flood; and there is presently a special-use authorized cabin near the mouth within the area of the historic Middle Creek mining camp. Resident rainbow trout are present. Barriers at the mouth, including steep gradient and waterfalls/cascades, prevent access by anadromous fish.

Project activities occur in the headwaters of several Grider Creek tributaries: Fish Creek, Rancheria Creek, and an unnamed stream (designated "Tyler Meadows Creek" for this document). Fish Creek and Tyler Meadows Creek are first-order perennials, and Rancheria Creek is third-order. All flow west, draining the ridgeline south of Lake Mountain Peak to the Marble Mountain Wilderness boundary. All three creeks contain resident rainbow trout; and, furthermore, steelhead are present in Rancheria Creek. While the upstream limit for rainbow trout in each stream is restricted by gradient, discharge, stream size, and/or barriers, Rancheria Creek does have a definite barrier about 0.5 miles upstream from the mouth restricting steelhead access.

Project activities occur in the extreme headwaters of several Klamath River tributaries: Kuntz Creek, Macks Creek, Mill Creek, and O'Neil. Kuntz Creek, Mill Creek, and O'Neil Creek are second-order perennials, and Macks Creek is first-order. All flow north, draining the ridgeline between Tom Martin Peak and Lake Mountain Peak. All streams contain rainbow trout. Additionally, O'Neil Creek has Coho and Chinook in the lower 300 feet below Highway 96, while Macks Creek may have steelhead below the highway. For all creeks except O'Neil Creek, the culverts crossing under Highway 96 form barriers to fish upmigrating from the Klamath River. While passage at O'Neil Creek was addressed by construction of a bridge, subsequent observations determined it likely that a flow barrier under the bridge persisted. The substrate below the bridge was sealed during the summer of 2012, and surface disconnection under the bridge no longer occurs. SONCC Coho salmon can now ascend O'Neil Creek above the bridge crossing, but suitable habitat for them is limited by quickly steepening gradient. Within streams, upstream distribution of trout is restricted by gradient, discharge stream size, and/or natural barriers.

Multiple fishless tributaries to the Scott River and Klamath River are within the Project area. They may be perennial, intermittent, or ephemeral. The named streams within allotment boundaries (current and/or proposed) include Deep Creek, Jim Creek, Louie Creek, McCarthy Creek, and Townsend Gulch. Salmonid distribution, including SONCC Coho salmon, is associated with the confluence zones of these creeks with their respective rivers.

Of particular interest, many of the streams in the Project area experienced extensive scouring during the 1964 and 1997 flood events. Flood impacts were likely exacerbated due to historic mining practices, fire, timber harvest, and roading. Satellite and aerial imagery, such as that available from services like GoogleEarth, which date from the years following the 1997 event clearly show areas of channel scour, as well as evidence of earth movement originating from the road system and clear-cuts. On the ground, signs of flood impact and on-going system adjustment include areas of aggradation and downcutting, streambanks comprised of cobbles and other coarse material (i.e., lacking a developed soil covering), riparian forest in early- to mid-seral stage, and general lack of woody debris (because it was transported out of the system). Not all streams were affected equally, and some systems, or portions within a larger drainage, may have experienced little to no impact.

Composition of riparian vegetation within the Project area is very diverse, reflecting differences between locations in regard to elevation, slope aspect, soil character, timber harvest and wildfire history, and local hydrologic condition. Large-scale scouring by recent floods, especially 1964 and 1997, as referenced above, has reset the riparian to an early- to mid-seral progression in many places, with regrowth retarded due to banks being reduced to cobbles and other coarse materials. Alders, big-leaf maple, cottonwood, and willow are common deciduous species; and evergreens may include Douglas-fir, western red-cedar, and other conifers. Drier, low elevation areas also may support madrone and Ponderosa pine. Several meadows are present in headwaters drainages, the largest of which are "Faulkstein Camp Meadow", "Kuntz Meadow", Middle Meadow, and Tyler Meadows.

Width of the riparian zone is varied and heavily dependent upon persistence of water (surface and subsurface) in relation to the stream channel and microclimate conditions. In dry locations such as ephemerals and short-season intermittents, the riparian zone may extend less than five feet from the channel margin and classic riparian vegetation such as alder or willow is not continuous. The contrast between riparian and uplands is obvious/stark. On the other hand, wetter systems with a developed floodplain, such as along lower Tompkins Creek, have a much wider area where groundwater influence allows growth of species which require proximity to water. The transition of "riparian" to "upland" is much more subtle, and may be difficult to definitively delineate. A stream "riparian zone" is different from the "Riparian Reserve" of the Land Resource Management Plan, the latter of which is a standard-width derived land allocation whose purpose is to serve as a planning tool. The width of a "Riparian Reserve" is generally greater than a stream's true riparian zone, and often includes true upland vegetation within it.

As with the riparian, the uplands are varied when considered across the landscape area of the Project. Brush fields, oak savannah and oak/pine woodlands, ponderosa pine, Douglas-fir, and western red-cedar are present. Past timber harvest activities upon Forest Service land, some as recent as the 1980s, created large clear-cuts, particularly in the Tompkins Creek and Middle Creek drainages, which were subsequently replanted to monoculture conifer plantations. The exact species composition of local vegetation is dependent on elevation, aspect, soils (both natural and as affected by historic mining practices), timber harvest, fire, and microclimate.

The location of Coho and essential fish habitat is shown in **Appendix A**.

Table 5. Summary of actual and potential occupancy by analysis species of creeks/rivers within 7^{th}- and 5^{th}-field watersheds.

Species	7th-Field							5th-Field	
	Klamath River	Scott River	Grider Creek	Macks Creek	O'Neil Creek	Rancheria Creek	Tompkins Creek	Lower Scott River	Seiad Creek-Klamath R
Coho	X	X	X		X		X	X	X
Chinook	X	X	X		X		P	X	X
Steelhead	X	X	X	P	X	X	X	X	X

X - confirmed presence
P - potential presence

Existing and Recent Historical Allotment Use
This subsection is summarized from the "Rangeland Resource Report" (USFS 2014a). For additional comprehensive information, refer directly to the document.

Lake Mountain – Grazing of the current allotment area has occurred since at least the 1920s. Prior to 1973, the allotment extended to the north side of the Klamath River as a spring range, but has since been abandoned. Rangeland capability has likely undergone a long-term decline to its present estimated acreage (**Table 3**) due to a decrease in timber harvest, which formerly created transient forage by opening the canopy via clearcuts, landings, and other practices. The most intensive grazing occurred around 1940 when there was a high of 400 HMs. This number displays a long-term decline to the currently permitted 76 HM (**Figure 1**). The proposed action would maintain the current amount of allowed use.

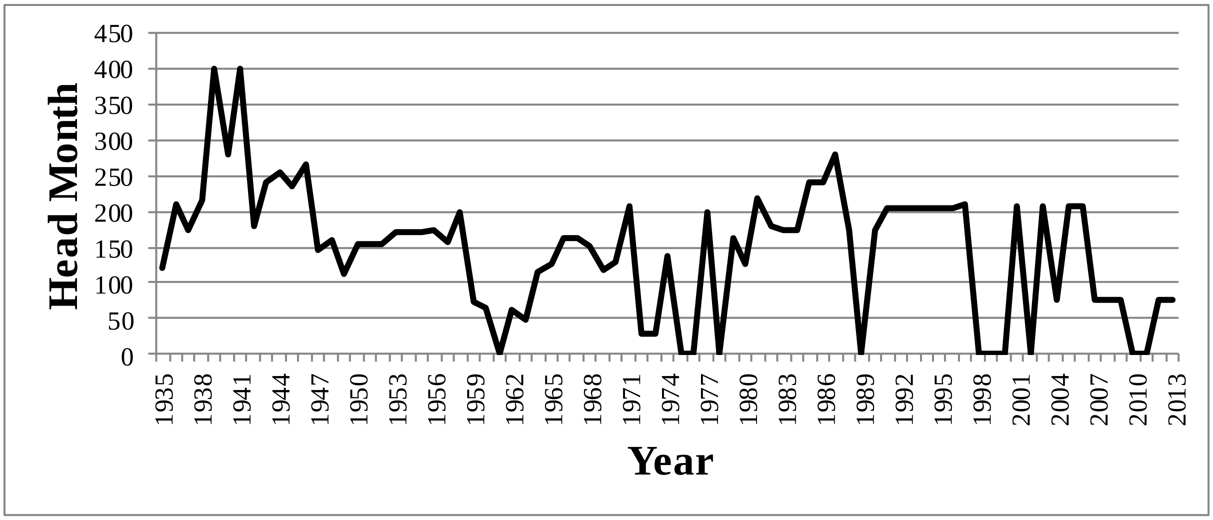


Figure 1. History of Lake Mountain Allotment permitted HMs.

Monitoring site placement and type of monitoring utilized has been adjusted over time, reflecting changes in the science of monitoring, so as to ensure better replication, track trends, and improve overall data quality/utility. Synthesis of available data suggests the long-term trend for Lake Mountain Allotment is static to upward. The allotment, including the more heavily utilized areas, is presently considered to be in satisfactory condition. A localized exception is Lookout Spring. One of the proposed action elements for the Project will improve the spring so as to address this issue. Of additional note, monitoring photo documentation and aerial photos have observed increased tree canopy over the last 50 years in the vicinity of Kuntz Creek headwater meadow, including conifer encroachment into the meadow. This is likely due to natural succession in the absence of fire and timber harvest.

Middle Tompkins – Grazing within the allotment area has occurred since at least the 1920s, although allotment configuration has been variable. In particular, the Tyler Meadows, Faulkstein Camp, and Yellowjacket Springs areas have sustained livestock under several different management plans. The proposed action allotment configuration was established in 1979. Although an apparent error in digitization in 1995 created the "current" boundary, subsequent livestock distribution and AOI documents have continued to reflect the pre-1995 condition.

Similar to Lake Mountain Allotment, overall forage capability in the Middle Tompkins Allotment has likely declined over time to its current estimated extent (**Table 3**). However, some selective harvesting and an increase in fuels treatment projects does continue to open transient hillslope range. For much of its recent history, Middle Tompkins Allotment permitted 450 HMs. To address unfavorable range conditions and difficulty in maintaining appropriate cattle distribution, livestock numbers were reduced beginning in 2004; non-use began starting in 2007; and in 2010 the permittee waived further use of the permit, returning it back to the government. Therefore, Middle Tompkins Allotment has had no grazing since 2007, and it is now to be resumed by this Project. The proposed utilization level of 250 HMs would be a decrease over the long-term average (**Figure 2**).

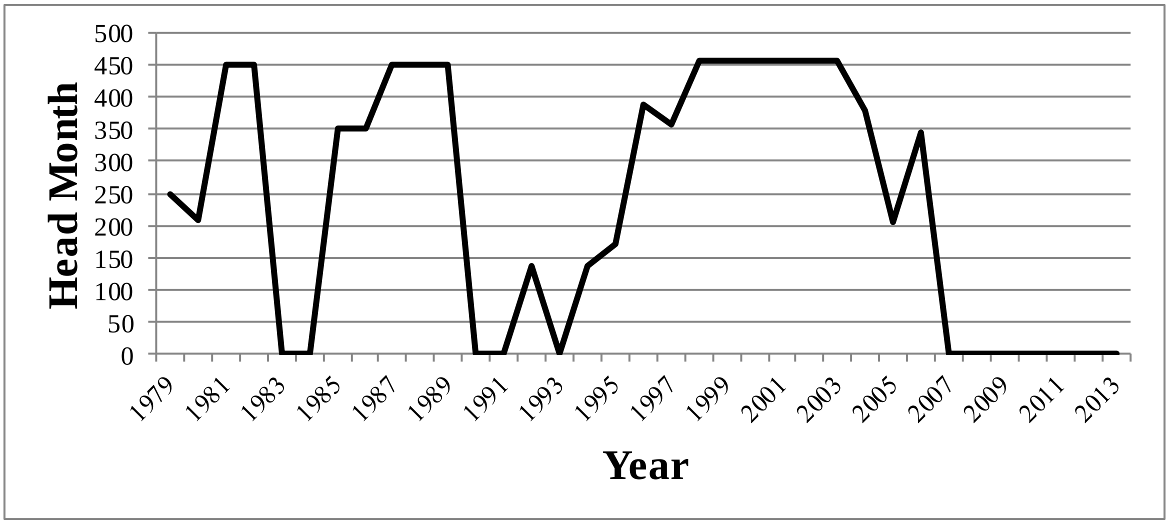


Figure 2. History of Middle Tompkins Allotment permitted HMs.

Similar to the Lake Mountain Allotment, monitoring within Middle Tompkins Allotment has altered over time. Past monitoring has suggested unsatisfactory conditions with little change in the trend, but these results were influenced by poor site placement. In preparation for resumption of grazing, monitoring sites have been re-established at more appropriate locations and evaluated using updated protocols. All sites are considered to be satisfactory, with overall trend to have been upward since cessation of use in 2007.

Following a 1997 NMFS Biological Opinion on grazing on the KNF, a monitoring strategy for Middle Tompkins Allotment was developed. Focus was placed upon Tompkins Creek as the only anadromous stream within the allotment potentially accessible by cattle. A photo point was established downslope of the holding corral. Photos taken 1998 through 2013 document recovery from the 1997 flood that scoured the creek, but no evidence of livestock is seen. Furthermore, monitoring reports submitted from 1998 through 2008 specifically note that there was no grazing use along the anadromous portion of Tompkins Creek due to lack of desirable forage (USFS 2009).

Aquatic Emphasis Areas

Aquatic emphasis areas are sites where livestock concentrate grazing within an allotment, and that also contain stream channels that are accessible to cattle. Additionally, stream channels must be perennial or intermittent in nature, thus potentially connecting grazing impacts with downstream fish habitat. Within allotments, KNF range personnel have identified areas of high or medium use. Forage utilization in "high use" areas is usually 50% or greater in years that grazing occurs, while "medium use" normally exhibits 35-50% utilization. High use areas may also include a history of overutilization. Concentrated use areas (see **Appendix B**) are typically meadows associated with a water source. The water source may be a spring or seep that dries before or shortly after leaving the meadow, and are thus disconnected from conveying grazing impacts downstream. Only concentrated grazing use locations which exhibit connectivity with downstream habitat, and therefore have the potential to affect Coho CH, are defined to be aquatic emphasis areas, and will be tracked through the following analysis. Prominent concentrated use areas, such as the unnamed meadow complex east of Browns Knob, are not identified as aquatic emphasis areas because there is no aquatic connection downstream/downslope. See **Table 6** and **Maps A-5, A-6** for Project aquatic emphasis areas. Additionally, **Appendix B** provides a brief description of all locations of concentrated use.

Table 6. Aquatic emphasis areas, including general location, use level, and acres.

Allotment	Aquatic Emphasis Area[1]	General Location	Use Level	Acres
Lake Mountain	"Kuntz Meadow"	Kuntz Ck headwaters	High Medium	11.6 68.6
Middle Tompkins	"McCarthy Meadow Complex"	McCarthy Ck headwaters	Medium	5.6
	"Rancheria Spring Complex"	Rancheria Ck headwaters (north)	Medium	17.6
	"Maple Spring Complex"	Rancheria Ck headwaters (south)	Medium	11.6
	"Faulkstein Camp Meadow"	Fish Ck headwaters at Faulkstein Camp	Medium	20.1
	Tyler Meadows	Tyler Meadows Ck headwaters	High Medium	13.3 10.7
	"Tompkins Meadows Complex"	Unnamed Tompkins Ck tributary headwaters	Medium	26.8
	Middle Meadow	Middle Meadow (unnamed Middle Ck tributary)	High	17.0

[1]Most meadows and forage concentration areas do not have formal placenames. Except for Middle Meadow and Tyler Meadows, all names are as used by KNF range personnel and other staff.

Monitoring data show that locations that receive low use (less than 35% utilization) are not likely to approach any Project standards that will trigger administration of adaptive management actions. There is no probability that impacts to downstream CH would initiate from low use areas, therefore this analysis focuses on high and medium use sites. In wet meadows, impacts could only occur if these areas were heavily stocked and over-grazed without much rest. Since the Project does not involve heavy grazing (numbers are low, period of rest is long, and annual utilization monitoring eliminates heavy grazing), there is no probability that grazed wet meadow areas without cattle-accessible stream channels could impact downstream fisheries habitat.

Tompkins Creek within CH is not an aquatic emphasis area, as no concentrated use areas occur along it. Additionally, although GIS modeling indicate it to be “capable” of grazing use, site visit by the District Fish Biologist has found forage suitability to be low due to a dense riparian overstory limiting grass/herb growth, and accessibility for cattle would be difficult due to topography, as well as the large percentage of cobbles and boulders comprising the banks (**Photo 1a, b**). The observation of limited forage availability is supported via a summary report to NMFS for ten years of monitoring (1998 to 2008) for Middle Tompkins Allotment (USFS 2009). Any use by livestock is expected to be incidental and fleeting when livestock are gathered and actively moved along the road system, over Tompkins Creek via a bridge on 46N64, and up the ridge. After this relocation, livestock spend the remaining period of grazing on the more open upper slope and ridgetop areas.

Cattle grazing in general forested areas, which comprise the majority of acreage in the allotments, is dispersed and minimal and not considered to be a potential trigger for effects to aquatic habitat or watershed processes. Riparian areas outside the primary meadows tend to be inaccessible to cattle due to steep slopes and rocky areas, and therefore could not be affected by the Project.

Photo 1a & 1b. Typical mainstem Tompkins Creek habitat conditions, including rocky banks and dense riparian overstory limiting development of livestock forage.

2014 Happy Camp Complex Fire

The Happy Camp Complex Fire burned approximately 117,000 acres in summer 2014 upon three Ranger Districts of the Klamath National Forest. The entirety of both allotments comprising the Project area were affected. In general, the Project area experienced a mosaic burn, with most locales exhibiting either low burn severity or no burn, with vegetation expected to return to pre-fire condition within a few years. Locales of moderate and high burn severity are also present.

Aquatic emphasis areas were minimally affected. Where impacts occurred, burning was light and generally restricted to meadow grass and peripheral trees and brush. Conditions within and in channels immediately downstream of emphasis areas are largely as observed pre-fire. At some sites, such as below Middle Meadow, in-channel woody debris were burned, but future input from fire-weakened trees is anticipated to eventually compensate. Therefore, descriptions of aquatic emphasis areas provided in **Appendix B** remain valid. Fire effects are expected to primarily resolve at the landscape scale, and will be discussed, where relevant, within the appropriate Indicator.

To allow for post-fire recovery of vegetation and silvicultural activities (e.g., fire salvage harvest, hazard tree abatement, ground preparation and tree re-planting), livestock use will be modified within the Project area (McMorris, pers. comm.). For Middle Tompkins allotment, livestock will not be authorized until 2016. Lake Mountain allotment will be grazed in 2015, but animals may be turned out at a later date and/or the season may be shortened in the fall. These are the minimum modifications for livestock use, with post-fire range conditions subsequently informing management.

Effects Analysis Process

This section describes the existing habitat conditions and contains an analysis of the direct and indirect effects of the Project on listed anadromous fish and their habitat (including CH and EFH) at the site, the 7th and/or the 5th field watershed scales. The habitat requirements (expressed by the Indicators) are similar for all salmonids considered in this BA. Existing conditions and effects are rated using criteria variously listed in **Table 8**, **Appendix C**, and the Efficiency Measures subsection.

The analysis of the potential effects to anadromous fish and their habitat is organized by direct and indirect effects and by effects to Indicators of anadromous fish habitat conditions. The Indicators originate from Appendix A of the AP (*Table of Population and Habitat Indicators)*. The evaluation is described below and summarized in **Appendix C** and **D** of this BA. "Population characteristics" and "Population and habitat" pathways listed in Appendix A of the AP were not evaluated for anadromous fish since the AP states those pathways are for bull trout at this time. The population status is discussed in **Appendix D** of this BA. The pathways in the table are addressed based on the best available information. If there is potential causal mechanism for effects to an Indicator from a Project Element (PE) or Project Element Group (PE Group), then the PE or PE group is evaluated for effects to the Indicator using "Factor Analysis". In Factor Analysis, the effect of each PE or PE group on each Indicator is analyzed using some or all of the following factors in the following order: <u>Proximity</u>, <u>Probability</u>, <u>Magnitude</u> (severity and intensity), <u>Distribution</u>, <u>Frequency</u>, <u>Duration</u>, <u>Timing</u>, and <u>Nature</u>. The Factor Analysis is performed to determine if there are purely neutral and/or positive effects on fish habitat Indicators, or if any negative effects are discountable or insignificant. If it is concluded that the effects to a factor related to an Indicator are neutral (no effect), discountable (extremely unlikely to occur) or insignificant (effects are not able to be meaningfully measured, detected, or evaluated), then additional factors in the sequence above do not need to be evaluated (AP, Page 11 and 49). The Factor Analysis is not used for the Habitat-Watershed Condition Indicators (AP, Step 5, Page 12). After the appropriate Indicators have been evaluated a "Project Effects Determination Key" uses the resulting evaluation information to determine overall effects (NE, NLAA, LAA) on Coho salmon, Coho salmon CH, and EFH.

Environmental baselines of the project watersheds, and effects of Project PEs and PE groups on the baselines that serve as proxy for indirect effects to anadromous fish are detailed below. **Appendix D** summarizes environmental baselines and project effects for the seventeen Indicators, with data sources identified.

Consideration of the intensity and extent of the proposed action as well as the proximity of anadromous fish to Project activities and the distribution and life history of anadromous fish (**Appendix F**) in the Analysis Area assisted in making the final ESA effects determination for the Project. The proximity of PEs relative to anadromous fish and their habitat are found in **Table 7**.

For this BA, it is assumed that spawning, rearing, feeding, and migration can occur within all habitat occupied by any of the ESUs and of anadromous fish addressed in this document, unless otherwise stated. In some streams, habitat may be suitable, but the best stream survey information indicates the habitat is not occupied. The probability for short and long-term indirect effects to anadromous fish is associated with direct effects and effects to instream habitat in the context of existing conditions. Thus, after refining the analysis through the Efficiency Measures for geographic location, PEs, and Indicators, then direct effects to anadromous fish, including SONCC Coho salmon and their habitat are analyzed, followed by existing condition and effects from each project element on each Habitat Indicator.

Table 7. Summary of closest distance between Project activities and anadromous fish and their habitat (including Critical Habitat) – 7th and 5th field watersheds. Focus is on concentrated use areas. If watersheds do not have concentrated use areas, then distance to proposed allotment boundary is provided.

Watershed	Stream Name	Distance to Habitat occupied by Coho and CH (miles)	Distance to Habitat occupied by Steelhead Trout (miles)	Distance to Habitat occupied by Chinook (miles)
7th-Field Watershed(s)				
Deep Creek-Scott River	*No fish-bearing streams*	*Closest treatment same for all species [to Scott River]* Boundary - >300' (adjacent to County Rd 7F01) (No concentrated use areas in this watershed)		
McCarthy Creek-Scott River	*No fish-bearing streams*	*Closest treatment same for all species [to Scott River]* Conc. Use - 2.4 [via McCarthy Ck and McCarthy Ck tributary]		
Middle Creek	Middle Creek	N/A - no Coho present in Middle Creek	N/A - no Steelhead present in Middle Creek	N/A - no Chinook present in Middle Creek
Tompkins Creek	Tompkins Creek	Con. Use – 1.9	Con. Use – 1.2	N/A - no Chinook present in Tompkins Creek
O'Neil Creek	O'Neil Creek	Boundary - 2.6	Boundary - 1.8	Boundary - 2.6
		(No concentrated use areas in this watershed)		
Rancheria Creek	Rancheria Creek	N/A - no Coho present in Rancheria Creek	Con. Use - 3.6	N/A - no Chinook present in Rancheria Creek
Tom Martin Creek-Klamath River	Kuntz Creek Macks Creek Mill Creek Mitchell Creek	N/A - no Coho present in Kuntz, Macks, Mill, or Mitchell Creek	Con. Use - 2.7 [via Macks Ck] (No Steelhead present in Kuntz, Mill, or Mitchell Creek)	N/A - no Chinook present in Kuntz, Macks, Mill, or Mitchell Creek
Schuttz Gulch-Klamath River	*No fish-bearing streams*	*Closest treatment same for all species [to Klamath River]* Watershed not within Proposed allotment boundary No concentrated use areas in this watershed		
Upper Grider Creek	Grider Creek Fish Creek Tyler Meadows Creek	*Closest treatment same for both species* Grider Creek - Conc. Use - 2.5 ([via Fish Ck] Coho/Steelhead present, but entirety of stream outside allotment boundary; see 5th-Field Watershed) N/A - no Coho/Steelhead present in Fish or Tyler Meadow Creek		N/A - no Chinook present in Fish or Tyler Meadow Creek, nor Grider Creek within the watershe7th-field boundary
5th-Field Watershed(s)				
Lower Scott River	Scott River	*Closest treatment same for all species* Conc. Use - 2.4 [via McCarthy Ck and McCarthy Ck tributary]		
Seiad Creek-Klamath River	Grider Creek	*Closest treatment same for both species* Con. Use - 2.5 [via Fish Ck]		Con. Use - 4.0 [via Rancheria Ck]
	Klamath River	*Closest treatment same for all species* Con. Use - 2.8 [via Macks Ck]		

Efficiency Measures Analysis

Efficiency Measure for analysis: (Specific PEs which do not affect Coho or anadromous fish habitat within the Action Area)

Six Project elements as described in the "Proposed Action" section will not affect Coho Salmon or Critical Habitat, and therefore will not be further discussed:

- **Adaptive Management Strategy** – Administration of permits utilizing an adaptive management strategy has no direct mechanism to affect Coho or Critical Habitat. The PE for livestock grazing will cover potential Project effects including the influence of adaptive management strategies.
- **Allotment Boundary Adjustment** – Adjustment of allotment boundaries will not affect Coho or Critical Habitat because this action is an administrative exercise being taken to reflect actual animal distribution and forage utilization. Neither physical benefit nor impairment will result from this change. Terrain, lack of water and/or forage, and other factors already prevent animals from accessing those portions of allotments proposed to be excluded from the boundary. Conversely, the adjustment which increases Middle Tompkins Allotment in size will not open new areas to grazing because these areas were utilized prior to the 1995 boundary digitization, and have been included within permits subsequent to that year. See "Proposed Action" and "Existing Environment" sections for more information as to history of allotment boundaries. The PE for livestock grazing will cover the potential effects of cattle use within the proposed boundaries.
- **Livestock Transportation** – Livestock is hauled to turnout location (Lake Mountain Allotment) or corral (Middle Tompkins Allotment) by vehicle. Due to the relatively small number of animals permitted, standard cattle/horse trailers are utilized, not commercial hauling rigs. Animals gathered at the end of the season are transported from the allotments by the same equipment. Because cattle are moved into the allotments by vehicle, they do not have the opportunity to wander and access water and forage along their path as might occur if they were being herded to pasture from an off-Forest location. Therefore, impact of livestock transportation is no more than would be expected given general vehicle use upon the KNF road system. Active herding of livestock within allotments, including between pastures and end-of-season gathering, is addressed under the PE for livestock grazing.
- **Monitoring** – Monitoring techniques involve minimally invasive, non-mechanized instream work that is outside of Critical Habitat and will not result in any downstream effects to Coho.
- **Lookout Spring Redevelopment** – Redevelopment of Lookout Spring will involve a minimal degree of non-mechanized ground disturbance at a hillside spring distant from Coho or Critical Habitat (over 3 miles). There is no surface connection of the spring to Kuntz Creek as water soaks into hillside soils with no scoured channel present. Some water from the spring will be diverted into a trough for livestock use outside the proposed exclosure fence; and water which overflows the trough will return back to the spring system.
- **Faulkstein Camp Meadow Headcut Exclosure** – The headcut exclosure at Faulkstein Camp Meadow will be of a fence type which does not require ground disturbance. Distance from Coho or Critical Habitat is about 2.5 miles.

Other adaptive management structure options are not known at this time, and therefore cannot be analyzed. If additional structures are proposed, they will be evaluated upon need to consult based upon proposed action and location upon the landscape in regards to Coho and Critical Habitat.

<u>Efficiency Measure for analysis:</u> (Geographic areas where PEs do not affect Coho or anadromous fish habitat within the Action Area)

Focus for analysis is upon aquatic emphasis areas, as these locations represent concentrated livestock use where animals have access to streams that are connected to fish occupied waters. As discussed previously in this document, low use riparian areas are not expected to trigger significant effects and/or associated adaptive management actions. Furthermore, there is no probability that transient animal use of low use areas will cause downstream impacts to CH.

The following 7^{th}-field watersheds which <u>do not</u> contain aquatic emphasis areas will not be carried further in the analysis:

- **Deep Creek** – The Deep Creek 7^{th}-field watershed is a "compound watershed", meaning it incorporates multiple unconnected drainages to the east and west side of Scott River in its boundary. Within the Project area, Deep Creek is the principle stream, and it has been assessed as fishless. The Deep Creek subdrainage itself will be excluded from the proposed Middle Tompkins boundary (see **Appendix A**, Map A-2). The remnant hillslope portion of the HUC which remains within the allotment supports minimal non-riparian capable forage areas.
    - Although Scott River is part of this 7^{th}-field watershed, it will be considered separately on the 5^{th}-field scale.
- **O'Neil Creek** – O'Neil Creek, the principle stream of this watershed, supports Coho, Chinook, and steelhead. Because a barrier prevents upstream access by spawning adults, the first two species primarily utilize the lowermost portion of O'Neil Creek as rearing and thermal refugia of juveniles produced elsewhere in the Klamath system. In addition to not supporting aquatic emphasis areas, much of this watershed will be excluded from the proposed Lake Mountain boundary; and capable areas in the headwaters minimally overlap within riparian areas (see **Appendix A**, Map A-1).
- **Schuttz Gulch-Klamath River** – In addition to not supporting aquatic emphasis areas, this compound watershed will be excluded from the proposed Lake Mountain boundary (see **Appendix A**, Map A-1).

The following 7^{th}-field watersheds with aquatic emphasis areas, but which have <u>no</u> Coho or CH, and thus no chance for exposure, are not carried further in the analysis:

- **McCarthy Creek-Scott River** – Within the Project boundary, McCarthy Creek is the primary drainage of this compound watershed, which is approximately 2.4 miles upstream of CH in the Scott River. One aquatic emphasis area is present – McCarthy Meadow Complex. No fish are present in McCarthy Creek (see **Appendix A**, Map A-2).
    - Although Scott River is part of this 7^{th}-field watershed, it will be considered separately on the 5^{th}-field scale.

- **Middle Creek** – Middle Creek, the principle stream of this watershed, does not support anadromous salmonids, although it is occupied by resident rainbow trout. One aquatic emphasis area is present – Middle Meadow.
- **Tom Martin-Klamath River** – There are multiple named creeks within this 7th-field watershed. Of note, Kuntz Creek drains the Kuntz Meadow aquatic emphasis area, which is approximately 4 miles upstream of CH in the Klamath River. Resident rainbow trout, but not anadromous salmonids, occupy Kuntz Creek.

Efficiency Measure for analysis: (Indicators that will not be affected by the PEs)

The following Indicators are to be excluded from analysis because PEs will not affect anadromous fish or their habitat:

Physical Barriers – There are human-made barriers upon several streams within or influenced by the Project area. Removal or modification of these barriers for fish passage is outside the scope of this Project. No new barriers will be built as a consequence of this Project.

Large Woody Debris – Within streams of the project area, generally conifers provide most of the habitat-forming large woody debris in fish-bearing reaches. Cattle will browse on leaders and leaves of woody brush (e.g., willow) and young hardwood trees species (e.g., alder, aspen, cottonwood). Cattle do not eat conifers; and livestock have been used in the Project area in the past to promote tree growth within plantations by suppressing competition from grasses, herbs, and brush (USFS 2014a). Cattle grazing along meadow streams reduces grass and shrubs but it does not impact existing large woody debris in/near channels, nor recruitment thereof.

Pool Frequency and Quality – The proposed grazing may cause only minor changes to the soil regime at the site level (see "Turbidity" and "Substrate" indicator effects discussion). Because of the limited extent and intensity of proposed grazing, sediment impacts are likely at only a few sites and would not be detectable at the watershed scale (as described in the Hydrology report [USFS 2014b]). There is low probability that the Project could cause channel-altering events with the power to move downstream and impact channel morphology in CH. Furthermore, grazing would not affect large woody debris, which can be an important component in regards to pool formation in montane systems (Buffington, *et al.* 2002). For these reasons, the project would not impact the frequency and quality of pools in CH, which is located over two miles downstream from aquatic emphasis areas.

Off-Channel Habitat – There is no overlap of Coho Critical Habitat with aquatic emphasis areas.

Off-channel habitat is generally not a significant component in narrow mountainous channel types (Rosgen A and B) with limited floodplain development, such as those present in much of the Project area. However, some off-channel habitat is present in lower Tompkins Creek within the reach of Coho CH. As discussed throughout this document, cattle are not attracted to mainstem Tompkins Creek due to lack of forage, rocky banks creating conditions of poor footing, and topography. Because livestock are not expected to be present, there will be no effect to off-channel habitat.

Refugia – Refugia is a synthesis of presence and degree of functionality of habitat elements for fish throughout their life history. Consideration may include stream temperature, water quality, riparian reserve, water flow, sediment in pools, and connectivity. As there will be no change in the ability of riparian or instream habitat components to maintain present fish populations, nor will connectivity between local and distal populations be altered, there will be no effect to this Indicator.

Width/Depth Ratio – The proposed grazing may cause only minor changes to the soil regime at the site level (see "Turbidity" and "Substrate" indicator discussion discussion). Because of the limited extent and intensity of proposed grazing, sediment impacts are likely at only a few sites and would not be detectable at the watershed scale (as described in the Hydrology report [USFS 2014b]). There is low probability that the Project could cause channel-altering events with the power to move downstream and impact channel morphology in CH. For these reasons, the project would not impact channel width to depth ratios in CH over two miles downstream from aquatic emphasis areas.

Floodplain Connectivity – Floodplains are generally not a significant component in mountainous channel types (Rosgen A and B) such as those present in fish-bearing reaches of the Project area. At only a few sites floodplains may be affected by grazing; as described in the Hydrology Report, less than 1% of all Riparian Reserves are within areas that receive concentrated/high use (and all areas receive at least 6 months rest annually). These areas are all least 2 miles above CH. As peak/base flows will maintain proper functioning, flow access to upper banks and side channels will continue to occur in a manner unchanged from current conditions.

Drainage Network – The drainage network can be roughly considered in light of road density, number of road crossings, and overall ERA, but primarily it is an aspect of how "connected" a drainage feature (road, ditch, or other feature) is to the natural hydrologic system.

Due to the steepness of the terrain and natural livestock behavior, cattle utilize roads and existing trails to move between forage areas within allotments. In the Project area, cattle use roads and roadbeds abandoned from past timber extraction or other management use. Because of the extended history of cattle use in the area, trails have long been established, and have been evaluated to be in stable condition. Most trails are associated with ridges, upper slopes, and fishless headwater areas because this is the location of all concentrated use sites and the majority of capable lands. Therefore, as livestock are expected to continue to use the current road and trail system at levels that are either less than or do not exceed recent use, there will be no change to the drainage network.

Road Density/Location – No roads will be constructed nor removed as a result of this Project and therefore this indicator will not be affected.

Riparian Reserves – Project grazing does not occur in Riparian Reserves associated with CH. The only location where cattle have the potential to enter Riparian Reserve associated with CH is along mainstem Tompkins Creek.

Herbaceous vegetation attractive to livestock is relatively sparse along the Tompkins Creek mainstem due to shading by trees and brush. Overstory vegetation primarily consists of conifers and large alder. Many of the alders present along the streambanks appear to be similar in age and were likely established following the scouring flows of the 1964 flood event. Because forage is not readily available and access to water is difficult due to rocky streambanks and topographical factors like steep slopes, cattle are not expected to be drawn to nor linger within this area. Furthermore, when livestock are being herded across Tompkins Creek at the Forest Road 46N64 crossing, animals will not be allowed to stop for either water or forage. Incidental use by cattle will have no measurable effect on the functionality or condition of the Riparian Reserve within Coho CH.

Overall, the impact to riparian vegetation along the Tompkins Creek mainstem due to the 2014 Happy Camp Complex was minimal, and in places there was little to no effect to trees or brush adjacent the creek (**Photo 2a, b**). With the exception of scattered individual tree mortality, streamside overstory alder and conifer remain intact post-fire. Where low burn severity did impact understory vegetation, recovery to conditions similar to pre-fire is expected to be swift (1 or 2 growing seasons), with vine maple, blackberry, and other fast-growing vegetation the species primarily affected (M. Meneks, pers. obs.).

Photo 2a. Burned understory vine maple. Basil resprout is present.

Photo 2b. Unburned location along Tompkins Creek.

Project grazing primarily occurs within aquatic emphasis areas, the closest of which is about 2 miles from CH. The only mechanism by which the Project could affect downstream Riparian Reserves is if it caused, or increased the likelihood of, channel altering events like debris flows or large and/or chronic sediment inputs. As reviewed under various relevant Indicator discussions (e.g., Substrate, Disturbance Regime and History, Streambank Condition), there is low probability that such will occur.

In summary, there will be no effect to the functionality or condition of Riparian Reserve within Project area for Coho or CH as a result of grazing.

See **Table 8** for an Indicator summary.

Refined PEs and locations for analysis:

The following Project Elements have the potential to affect Coho Salmon or Critical Habitat, and therefore will be included in the subsequent analysis:

- Livestock grazing within allotments (focus on effects from aquatic emphasis areas)
    - PE includes active herding of animals within an allotment, such as between pastures and end-of-season gathering.

The following Indicators are potentially affected by Project Elements, and therefore will be included in the subsequent analysis:

- Temperature
- Turbidity
- Chemical Contamination/Nutrients
- Substrate
- Streambank Condition
- Peak/Base Flows
- Disturbance History and Regime

Based on consideration of proximity of anadromous fish and their habitat, along with the probability of direct and indirect effects, the area where there is potential for anadromous fish exposure to Project activities within the analysis area (and therefore subject to effects analysis) is:

Site Scale

The distance between PEs and anadromous fish and their habitat is described in **Table 7**. No aquatic emphasis areas occur within or immediately adjacent to CH or anadromous fish habitat. Elsewhere in the allotments, livestock forage areas occur adjacent to streams outside of Coho Critical Habitat. Where cattle use potentially overlaps Coho CH is only along Tompkins Creek. However, lack of forage, rocky bankside terrain, and topography severely restricts desirability and access for livestock; and when animals are being active herded, they will not be allowed to water, forage, or otherwise linger when crossing Tompkins Creek via a bridge. Therefore, there are no site scale effects within CH. Indirect effects from proposed PEs may occur in 7^{th} and/or 5^{th} field watersheds and are described next.

7^{th}-Field Watershed Scale

Rancheria Creek – Rancheria Creek

Rancheria Creek is the principle stream of this 7^{th}-field watershed within the Project area. Steelhead are found in Rancheria Creek. Two aquatic emphasis areas are present – Maple Spring Complex and Rancheria Spring Complex.

Tompkins Creek – Tompkins Creek

Tompkins Creek is the principle stream of this 7^{th}-field watershed within the Project area. Coho and steelhead are found in Tompkins Creek. One aquatic emphasis area is present – Tompkins Meadow Complex.

Upper Grider Creek – Grider Creek, Fish Creek, Tyler Meadows Creek

Grider Creek is the principle stream of this 7th-field watershed, although only the Fish Creek and Tyler Meadows Creek tributaries are actually within the Project area. Coho and steelhead are found within portion of Grider Creek contained by this watershed area. Two aquatic emphasis areas are present – Faulkstein Camp Meadow and Tyler Meadows.

5th-Field Watershed Scale

Lower Scott River – Scott River; Seiad Creek-Klamath River – Grider Creek, Klamath River

All anadromous fish species of interest – Coho, Chinook, steelhead – are present in Grider Creek, Klamath River, and Scott River. This scale considers impacts on a large landscape scale, as well as potential distal effects to mainstem systems originating from fish-bearing (and non-anadromous) streams such as Middle Creek and Fish Creek, as well as fishless streams like McCarthy Creek.

Table 8. Summary of the effects on anadromous fish for Project Element/Indicator combinations. Bolded Indicators are discussed further in the text. Otherwise, an Indicator is assumed to impart no effect to fish or habitat due to the reason provided.

Indicators	Adaptive Management	Boundary Adjustment	Livestock Transport	Livestock Grazing	Monitoring	Exclosures	Comments
Temperature	0	0	0	-/-	0	0	Any localized changes in stream shading negligible and not detectable at watershed scale (USFS 2014b). **See text for additional discussion.**
Turbidity	0	0	0	-/0	0	0	Streams within fish habitat too rocky to respond to grazing; impacts to aquatic emphasis areas will not propagate downstream; potential short duration turbidity when cattle herded across Tompkins Creek
Chemical Contamination	0	0	0	0	0	0	No chemical treatments will be used
Nutrients	0	0	0	-/-	0	0	Potential for inputs of cattle waste; unlikely to be discernable beyond the local scale
Physical Barriers	0	0	0	0	0	0	No barriers removed or constructed
Substrate	0	0	0	-/0	0	0	Streams within fish habitat too rocky to respond to grazing; impacts to aquatic emphasis areas will not propagate downstream; potential short duration turbidity when cattle herded across Tompkins Creek
Large Woody Debris	0	0	0	0	0	0	Livestock do not affect large woody debris loading
Pool Frequency and Quality	0	0	0	0	0	0	No change in flows or sediment delivery
Off-Channel Habitat	0	0	0	0	0	0	Off-channel habitat limited; none present in aquatic emphasis areas
Refugia	0	0	0	0	0	0	No change in ability of habitat to support and connect fish populations
Width/Depth Ratio	0	0	0	0	0	0	Streams within fish habitat too rocky to respond to grazing; effects within aquatic emphasis areas will not propagate downstream (USFS 2014b)
Streambank Condition	0	0	0	-/-	0	0	Streams within fish habitat too rocky to respond to grazing; effects within aquatic emphasis areas will not propagate downstream
Floodplain Connectivity	0	0	0	0	0	0	No change in flows or sediment delivery
Change in Peak/Base Flows	0	0	0	0	0	0	No diversions added/removed; ERA model remains below threshold. **See text for additional discussion**.
Increase in Drainage Network	0	0	0	0	0	0	No change in livestock use of roads or trails
Road Density and Location	0	0	0	0	0	0	No roads constructed or removed from the landscape
Disturbance History and Regime	0	0	0	-/-	0	0	USLE/GEO models not affected by grazing. ERA model changes unable to be discerned from background variability. (Table 10) (USFS 2014b)
Riparian Reserves	0	0	0	0	0	0	Condition and functionality of RR character will not be altered (USFS 2014b)

0 = Neutral effects
- = Insignificant or discountable negative effects
+ = Insignificant or discountable positive effects
S-= Significant negative effects
S+ = Significant positive effects
/ = Short-term/long-term effects

Direct Effects to anadromous fish and habitat

Proximity and Probability:

See **Table 7** for proximity of PEs to anadromous fish and their habitat.

Direct effects to Coho salmon or its habitat will not occur because livestock will not overlap with Critical Habitat. Within the Project area, only Tompkins Creek has the potential for direct exposure. However, few Coho redds are observed when surveys occur, and by the time livestock are permitted on Middle Tompkins allotment, young fish will have emerged from the gravel and be mobile. Even if fish were late in emerging, early season movement of livestock in the allotment is to actively herd them up and away from Tompkins Creek towards water and pastures on the ridgelines. Finally, as discussed within the "Efficiency Measures Analysis" section, access into Tompkins Creek is difficult for cattle. As expectation of extensive pockets of forage along the mainstem is low, and livestock will be actively herded while crossing Tompkins Creek via a bridge, the possibility of livestock loitering near and/or entering Tompkins Creek, and thereby having any direct effects on SONCC coho salmon or their designated Critical Habitat, is negligible.

Magnitude:

No direct effects to Coho are expected because there is no chance of overlap between grazing and CH, with the exception of when livestock are being moved along roads near Tompkins Creek. The most vulnerable lifestages – eggs and fry in redds – are not expected to be present in Tompkins Creek concurrently with livestock in Middle Tompkins allotment.

Indirect Effects to anadromous fish and habitat (by Habitat Indicator)

Only concentrated grazing use locations which exhibit connectivity with downstream fish habitat have the potential to affect Coho and CH; these are referred to as aquatic emphasis areas (**Table 6; Table 9**). The following analysis tracks effects that may occur at aquatic emphasis areas, and how these effects may or may not be expressed downstream in fish habitat (CH).

Table 9. Aquatic emphasis areas tracked in the indirect effects analysis

Allotment	Aquatic Emphasis Area	Use Level	Acres	CH stream (Distance to CH)
Middle Tompkins	"Rancheria Spring Complex"	Medium	17.6	Grider Creek (4.5 miles)
	"Maple Spring Complex"	Medium	11.6	Grider Creek (4 miles)
	"Faulkstein Camp Meadow"	Medium	20.1	Grider Creek (2.5 miles)
	Tyler Meadows	High Medium	13.3 10.7	Grider Creek (2.7 miles)
	"Tompkins Meadows Complex"	Medium	26.8	Tompkins Creek (1.9 miles)

--Water Quality: Temperature--

This Indicator is rated by stream temperature, and the expected change from the existing condition due to Project activities (Appendix C).

Current Condition

Most streams in the Project area are considered to be "Properly Functioning" for water temperature. The exceptions are Scott River and Klamath River, both of which typically have elevated summer temperatures, potentially lethal to salmonids, due to the cumulative human impacts of dam impoundments, agriculture, clearing of riparian vegetation, and other factors.

Tompkins Creek has Coho Critical Habitat within Project boundaries. Although this stream is "Properly Functioning" as per the Northwest Forest Plan AP, it also exhibits slightly elevated temperatures in regards to State of California beneficial uses (Laurie 2012; USFS 2014b). However, this elevation is not regarded as abnormal and is a reflection of past flood events - in particular, 1964 and 1997 - scouring the banks and removing riparian vegetation (USFS 2014b). Long term recovery is ongoing (see **Photo 2a, 2b**), and water temperature is expected to slowly decrease over time (decades) as the canopy continues to fill in, assuming no additional flood impact. While there is little to no data, other drainages within the Project area also likely exhibit a similar natural slight increase in temperate, albeit insufficient to impact fisheries.

Grider Creek has Coho Critical Habitat downstream from the Project/allotment boundaries. Similar to Tompkins Creek, temperatures (as taken near the mouth, over 9 miles downstream of the Project area) are elevated in regards to State of California beneficial uses, but are still considered "Properly Functioning" as per the Northwest Forest Plan AP (Laurie 2012; USFS 2014b). Shade reduction due to flood scour is likely the primary agent of elevated temperatures, although past logging within the drainage, as well as existing riparian alteration on private property. It is expected that water temperatures closer to the project area, and therefore higher in the drainage, are cooler than those near the mouth.

2014 Happy Camp Complex Fire

A possible post-fire response is an increase in stream temperatures (Neary, *et al*. 2008). If this consequence occurs, and to what degree, depends upon amount of shading vegetation burned, as well as pre-existing factors such as topography and groundwater influence (further discussed below in "Post-Project Condition").

Within Project allotment boundaries, impact to the riparian area was generally light. For instance along mainstem Tompkins Creek, streamside understory plants such as vine maple and blackberry were burned, but overstory alder and conifer was left largely intact. Basil resprout of many understory species was occurring within a few weeks following the fire. Mortality of individual trees is expected, but not to the extent that stream shading is excessively affected and temperatures exhibit a meaningful biological impact. Brush and other understory plants are expected to recover to pre-fire conditions within a couple of years.

Elsewhere in the Happy Camp Complex Fire, and outside the Project boundary, areas of extensive riparian burn, including mortality to overstory vegetation, did occur. An example includes Grider Creek and many of its tributaries. Water temperature recovery to pre-fire conditions may require years to decades, depending on rate of riparian vegetation regrowth.

The current condition for the temperature Indicator has not been modified for this document due to the Happy Camp Complex fire. The fire only recently occurred, and the subsequent stream temperature response not able to be known at this time. Existing Forest temperature monitoring will track changing conditions in Grider Creek, O'Neil Creek, and Tompkins Creek. If conditions in the future are found to have changed from the current baseline, then appropriate adjustments to the Indicator status will occur.

Post-Project Condition

Proximity and Probability

Within aquatic emphasis areas, stream shade may be affected, but it will be localized and limited in extent. Open meadows where shade is created by overhanging banks and herbaceous vegetation potentially have the greatest exposure to grazing. However, stubble height restrictions limits amount of grass canopy removed; and effects to streambanks are expected to be minimal (see "Streambank Condition" Indicator). In many aquatic emphasis areas, dense thickets of alder and/or willow are present. These thickets not only provide stream shading, but maintain well stabilized banks and restrict streamside access by livestock. Some brush browse may occur, but it will be on the outer edge of the thickets, and not affect shade.

Water temperature is more complex than just vegetation, and can include factors (not an exhaustive list) such as topography; global latitude; east/west versus north/south aspect; stream width compared to riparian height; and inflow from groundwater, tributaries, and springs (Moore, *et al*. 2005; DeWalle 2008). There may be localized increases in insolation within aquatic emphasis areas as a result of grazing, but any increases in water temperature will be minimal, offset by downstream shade and groundwater/spring input. Overall, there will be no impact to water temperature at the watershed scale (USFS 2014b). As the nearest CH to an aquatic emphasis area is 1.9 miles, any localized impact to water temperature would be negligible and not biologically meaningful in downstream fish-bearing reaches.

Magnitude

In summary, while there may localized impacts to shade as a result of livestock grazing, it will be limited in extent with no effect to water temperature for either Coho or CH.

--Habitat Elements: Turbidity and Substrate--

Turbidity: This Indicator is rated by professional judgment following observation of conditions after high water events, amount of substrate fines, CWE models (USLE/GEO), and condition of Riparian Reserves (Appendix C).

Substrate: This Indicator is rated by percentage of substrate composition of finer material. Considered data can include composition of surface and subsurface of non-pool units, as well as volume of pools filled with fines. Where no or limited survey data is available, evaluation may utilize CWE (USLE/GEO) models and professional judgment (Appendix C).

Current Condition

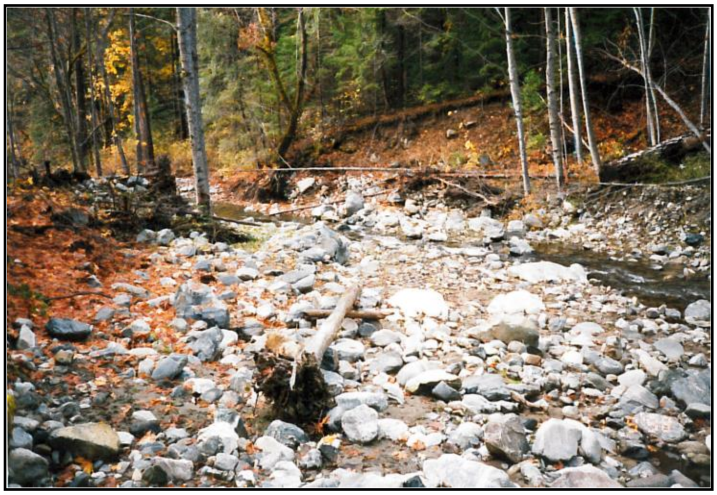
The turbidity and substrate Indicators are discussed together due of their close relationship.

Existing conditions are based upon CWE modeling and substrate data, where available, as well as professional judgment and observation. See "Disturbance History and Regime" subsection for further discussion of CWE models.

Tompkins Creek is considered to be "Functioning-At-Risk" for both turbidity and substrate Indicators. Although none of the CWE models indicate an elevated risk of surface erosion or mass wasting, sediment surveys and field observation suggest that an elevated amount of finer substrates are present within the substrate composition. The smaller substrate classes are of greatest interest because such material may either directly contribute to turbidity, else represent the presence of material easily mobilized during appropriate discharge conditions. A recent survey in 2011 detailing pool volume (V*) and surface/subsurface sediment composition reported the percentage of substrate finer material was elevated in comparison to reference conditions (USFS 2013). Additionally, in 2013, the District Fish Biologist walked approximately one mile of mainstem Tompkins Creek, beginning at the downstream allotment boundary. Numerous slumps and raw banks were observed. Erosion primarily appeared to be continued long-term impact from past flooding, although at least one slope failure from an abandoned road was noted (pers. obs.).

The status of Tompkins Creeks is considered to be a lingering effect of flood, as well as reflection of past timber practices and the current and legacy road system. Impacts to physical channel attributes are not associated with livestock, except potentially within areas of livestock concentration (USFS 2014b). Except for meadow areas, cattle generally do not have good access to creeks within the Project area due to steep slopes, rock, and/or thick riparian brush, and where access is possible outside of meadows, flood scour has hardened banks and channel bottom by exposing cobble and boulder. The long-term recovery of Tompkins Creek from the 1997 flood has been captured via the series of photos taken at the NMFS monitoring site near the Tompkins Creek Corral (**Photo 3a, b**).

Grider Creek is considered to be "Properly Functioning" for both turbidity and substrate Indicators. A 2009 pool volume and sediment composition survey reported the percentage of finer substrate material to meet reference conditions (USFS 2013). Furthermore, CWE models for the upper Grider Creek watershed are below the "1" risk threshold.



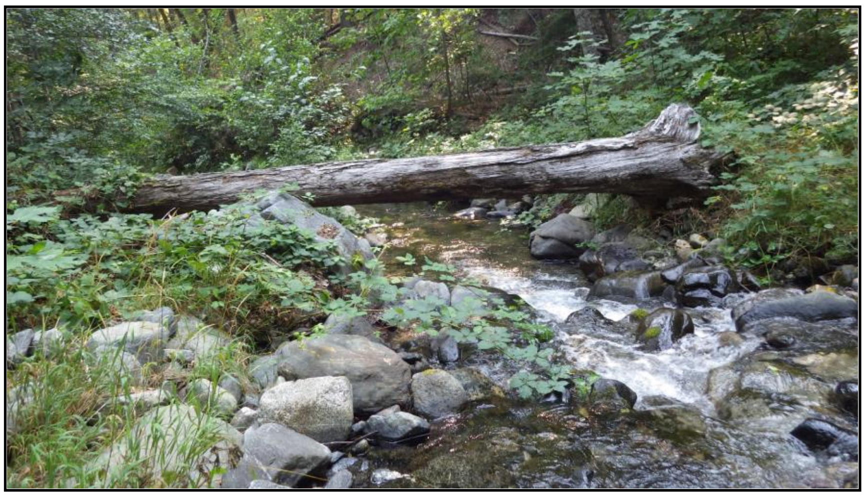


Photo 3a & 3b. Mainstem Tompkins Creek - NMFS monitoring photo point site. Documentation of recovery from 1997 flood between 1998 (upper) and 2013 (lower).

<u>2014 Happy Camp Complex Fire</u>
A potential landscape post-fire response is sediment mobilization (Neary, *et al.* 2008). This can occur catastrophically from debris flows, else more generally due to the overland movement. The risk and amount of sediment mobilization decreases over time as vegetation recovers (Neary, *et al.* 2008). Factors such as burn severity and extent, underlying geology, and degree of intact riparian vegetation determine how much sediment actually enters stream systems to impact the local aquatic habitat and ecosystem.

Creeks within and adjacent the Project affected by the 2014 Happy Camp Complex fire display elevated and lingering levels of turbidity following rain events, compared to pre-fire conditions. This observation is expected due to the initial mobilization of ash and other fine material (Neary, *et al.* 2008). How long this change in turbidity will persist for a given drainage is uncertain, but is related to burn severity and amount of drainage affected (Rhoades, *et al.* 2011; Neary, *et al.* 2008). Turbidity due to ash input should diminish quickly as normal winter precipitation and spring run-off flush the system. However, in some locations, conditions of elevated turbidity could persist if post-fire impacts include alterations in substrate composition that increase the amount of fine sediment.

Concerning catastrophic risk of sediment input within the Lake Mountain/Middle Tompkins Allotments Project area, the drainage at highest risk for post-fire debris flow is Grider Creek, with Tompkins Creek and O'Neil Creek of lower risk (USFS 2014c). The risk assessment model for debris flow is based upon the probability of a 5-year storm event within the first year following the fire, and as such there is no certainty that catastrophic impact will occur. Caveat provided, there was wide-spread occurrence of fire in the Grider Creek drainage, although the highest severity areas that contribute to elevated risk generally occur outside the Project area. Tompkins Creek and O'Neil Creek exhibit a much less elevation of risk.

Fine sediment yield is expected to increase throughout the fire area. Specifics are unknown, but those drainages with more and higher severity burned areas should exhibit a greater response. Within the Project boundary, vegetation associated with perennial and intermittent channels either did not burn, else endured low burn severity (USFS 2014d). Intact riparian vegetation can moderate post-fire impacts by filtering overland movement of sediment.

The current condition for the turbidity and substrate Indicators have not been modified for this document due to the Happy Camp Complex fire. The fire only recently occurred, and as such many "what-ifs" based upon landscape response to weather and seasonal considerations has yet to occur. Both direct effects (e.g., rain events) and indirect effects (e.g., time to vegetation recovery) have an influence upon turbidity and substrate composition. Existing Forest sediment monitoring will track changing conditions in Grider Creek and Tompkins Creek, CWE models are updated annually, and personal observations will continue. If conditions in the future are found to have changed from the baseline, then appropriate adjustments to the Indicator status will occur.

Post-Project Condition

Proximity and Probability

Turbidity describes suspended sediment in the water column. It is generally composed of very small particles like silts, because larger material is difficult to keep suspended except at high flows (Swanston 1991). Because a degree of turbidity is natural in stream systems, often observed during spring run-off and storm events, fish are adapted to it (Bjornn and Reiser 1991).

Due to the rocky nature of channels and streambanks throughout much of the Project area, aquatic emphasis areas are the primary sites where bare banks may occur as a result of livestock grazing. This is because bank composition in meadows tends to be fine-grained soils which are at higher risk to disturbance from hoof sheer, especially if the vegetation root mass is compromised. Neither current nor recent monitoring indicate bare streambanks to be of concern within the allotments in concentrated use areas (USFS 2014a; McMorris, pers. comm.); and utilization standards are designed to minimize detrimental impact to the grasses and shrubs which provide streambank cover. The incidence of raw banks is therefore expected to be localized and limited – e.g., livestock crossings, watering accesses, and similar.

The mobilization of fine sediment from small extents of raw or poorly vegetated streambanks is not well studied. Outside the laboratory environment, chronic and elevated levels of turbidity considered detrimental to aquatic organisms only occur following catastrophic natural incidents such as large landslides or extensive wildfires, or where human activities exacerbate sediment mobilization from extensive raw surfaces available for continuous stream erosion (Meehan 1991; Neary, *et al*. 2008). Therefore, if turbidity occurs at all, it is expected during run-off and storm events, similar to sediment mobilization from bare surfaces present elsewhere in the allotment drainages. Distance turbidity can be observed from its source in the case of limited exposure is not well studied, but appears to be spatially limited. For instance, a study commissioned by the Environmental Protection Agency found that turbidity caused by instream suction dredging returned to acceptable water quality levels within 250 feet (Royer, *et al*. 1999). Additionally, the KNF programmatic Facilities Maintenance and Watershed Restoration Biological Assessment included consultation upon minor instream activities such as culvert replacement, determining that turbidity was undetectable beyond a distance of 300 feet (USFS 2004). Within the Project area, the closest aquatic emphasis area to CH is 1.9 miles, well beyond the distance where turbidity is detectable.

Concerning substrate composition, within areas of concentrated use, some localized mobilization of fine sediment may occur, but allotment management practices, such as season-of-use and stubble height limits, will avoid alteration of channel attributes (USFS 2014b). Mobilization of sediment is expected to be less than 300 feet, beyond which any alterations to sediment composition will not be measurable from background variability. Within the Project area, the closest aquatic emphasis area to CH is 1.9 miles, well beyond the distance mobilization of fine sediment is detectable. Furthermore, any channel alteration which may occur within aquatic emphasis areas as a result of grazing will not propagate downstream to fish-occupied habitat because of channel stability provided by rock, large woody debris, thick alder/willow thickets, or a combination thereof.

Following the 2014 Happy Camp Complex, aquatic emphasis areas and Tompkins Creek mainstem were reviewed. Although there were locations where downed woody debris had been consumed, overall fire impact to aquatic emphasis sites and channels immediately downstream was minimal. Similarly, where riparian vegetation along Tompkins Creek was affected, it is expected to return to pre-fire conditions within the next several years. Therefore, the probability of livestock within concentrated use or sensitive areas augmenting post-fire sediment response is not expected.

An additional observation made post-fire was that several small alder adjacent to the 46N64 bridge over Tompkins Creek were cut to facilitate water tender access to the stream. Prior to the fire, the density of these alder lessened the probability that cattle would cross the creek beside the bridge, instead of on the bridge, when being herded between Middle Tompkins Allotment pastures. Until the alder recover, there is a higher probability livestock will trail through the creek, thereby producing a temporary increase in local turbidity as animals disturb streambanks and stream substrate. Active herding will insure that livestock stream access will be minimized.

Magnitude

Except for the 46N64 road crossing, neither turbidity nor substrate impacts within Coho CH are expected. Localized occurrence of raw banks resulting from livestock grazing may occur within aquatic emphasis areas. Where bare banks are observed, turbidity will be of short duration and spatially limited; and any changes to substrate composition will be localized and not propagate downstream. The exception is the 46N64 bridge due to removal of alder during fire suppression activities. Until the alder recovers to its pre-fire condition, livestock may be more likely to cross the creek directly, instead of utilizing the bridge, when being herded across the allotment. Though not expected, if this were to occur, any turbidity from this source would be of short duration (i.e., when animals are crossing) and limited in spatial extent. Similarly, alteration of substrate composition will be spatially restricted, with reversion to its customary character expected following annual high water events.

--Water Quality: Chemical Contamination/Nutrients--

This Indicator is rated by potential for nutrient contamination, and the expected change from the existing condition due to Project activities (Appendix C). Due to a lack of a specific category, fish pathogens will also be discussed.

Current Condition

For nutrients, most aquatic systems within the Project 7^{th}- and 5^{th}-order drainages are considered to be "Properly Functioning". No sources of contamination have been identified by the KNF. The exceptions to the above condition are the Scott River mainstem and Klamath River mainstem, both of which are "Not Properly Functioning".

A segment of mainstem Scott River under the 2012 303(d) list is listed for the water quality concern of "biostimulatory conditions" (CRWQCB 2014). This category is a general term for any process, including nutrient enrichment, that may promote aquatic growth to where it becomes a nuisance or causes adverse effects to beneficial uses. It is used when the causal agent for algal blooms may not be readily apparent or able to be linked to a specific source. The specific segment listed for the Scott River is "Young's Dam to Boulder Creek". While this reach is technically outside the Project area, it is upstream of it and there is no barrier for any effects originating thereof to affect the downstream Scott River within the Project area.

The 2012 303(d) list cited Klamath River, including the reach adjacent to the Project area, as possessing "nutrient" and "organic enrichment" concerns. These pollutants are restricted to the mainstem except where tributaries are specifically named. There are no Klamath River tributaries listed for nutrients or organic enrichment within the Project area.

Post-Project Condition

Proximity and Probability

Within the Klamath River system, *Ceratomysa shasta* (*C. shasta*), *Ichthyophthirius multifiliis* (Ich), and *Flavobacterium columnare* (Columnaris) are the primary mortality-inducing pathogens which affect salmonid health. *C. shasta* causes mortality in juvenile fish, while Ich and Columnaris generally attack adults returning from the ocean to spawn, although other lifestages can be infected.

Neither Ich nor Columnaris will be further discussed in relation to this Project. While both pathogens are widespread in the Klamath River basin, and undoubtedly are responsible for individual deaths, large fish-kill events, such as that observed in 2002, are related to factors not influenced by grazing. Specifically, the 2002 mass mortality appears to have been linked to low river flows downstream of Iron Gate Dam causing upstream migration delays, with temperature a possible contributive factor by increasing the stress of holding fish, as well as creating better conditions for pathogen growth (Belchik, *et al.* 2004).

The pathogen *C. shasta* has very complex lifecycle. As discussed by Stocking (2006) and Stocking and Bartholomew (2004), *C. shasta* will affect a number of fish species, including salmonids, but for one leg of its lifecycle it has an obligate intermediate host – the polychaete worm *Manayunkia speciosa*. Habitat for *M. speciosa* is primarily in organic matter and fine bottom sands, although it will also infest *Cladophora*, an algal species that thrives in nutrient-enriched waters such as the Klamath River mainstem, so much so that it will form extensive mats. It is believed that habitat alteration by Iron Gate Dam, including elevation of fine sediment and creation of general conditions encouraging *Cladophora* growth, has promoted *M. speciosa* populations. With an increase in intermediate host availability, prevalence of *C. shasta* has also increased compared to elsewhere in the watershed. Although Iron Gate Dam, as well as basin-wide impacts from agriculture, has the greatest impact to river health as it relates to fish infection by *C. shasta*, there is the slim potential within Project allotments for grazing to contribute to the detrimental environmental conditions, as is analyzed below.

Contamination of streams with excess nutrients, specifically nitrogen (N) and phosphorous (P) from cattle feces and urine is often a concern in rangeland management. If nitrogen and phosphorus are sufficiently elevated, grazing in the Project area could hypothetically further encourage growth of algaes such as *Cladophora*, ultimately compounding the existing *C. shasta* issue. However, such is not expected to occur in the Project area. In general, mountainous headwater systems such as those in the Project area are N and P limited, and so these nutrients are quickly absorbed by plants, microbes, and other biota when available (Hill, *et al.* 2010; Peterson, *et al.* 2001). A comprehensive study which included examination of nutrient loading in grazed Forest Service allotments in northern California found to be below the level of ecological concern; neither N nor P were significantly related to cattle density, HM, or grazing duration; and only in a few instances did N or P exceed recommended water quality benchmarks (Roche, *et al.* 2013). Other sampling of N and P within grazing allotments have also reported very low concentrations of these nutrients, sometimes below detection limits (EPA 1993; Adams, *et al.* 2009; Roche, *et al.* 2012).

An EPA report stated that unless fecal material is directly deposited into streams, the risk of nutrient enrichment is low, particularly for unconfined cattle grazing (EPA 1993). Cattle may deposit urine and fecal matter directly to streams only in areas where it is possible for animals to move down into stream channels to forage or cross the stream. Since the aquatic emphasis areas, well away from Coho CH, are the only locations where cattle are expected to concentrate in association with flowing water, the waste is expected to settle near where it is deposited. Only Tompkins Creek includes CH which is within an allotment and potentially directly accessible to cattle. However, due to lack of forage, dense riparian vegetation, and rocky bank substrate, livestock are not expected to linger. Additionally, when cattle are moved mid-season and end-season (see “Proposed Action – Livestock Grazing in Allotments”), they are actively herded, thereby reducing or eliminating the time when livestock are allowed to access the stream.

Magnitude

While there may be areas where nutrient impacts of Project cattle grazing are expected to be detectable, these will be associated with aquatic emphasis areas, which are distant from CH or fish occupied habitat. Elsewhere within the allotment, and especially in association with Tompkins Creek CH, there is very low possibility of nutrient input. Expected uptake of nitrogen and phosphorus by local biota means that nutrients will remain below the level of ecological concern, thereby not contributing to enrichment of areas affected by pathogens such as the Klamath River.

Overall, the Project may cause insignificant effects to this Indicator in aquatic emphasis areas upstream from CH, but will not be detectable within CH reaches downstream.

--Channel Condition: Streambank Condition--

This Indicator is rated by percent stability of the streambank. Where no streambank stability data is available, evaluation is a synthesis of density of road stream crossings, amount of inner gorge road, amount of clearing/compaction adjacent to the stream, presence/extent of berms constraining the channel, and visual impact from most recent channel altering event (Appendix C).

Current Condition

Streambank assessment of stability has been minimal in the Project area. The few surveys and assessments available suggest that stability in most places is either "Properly Functioning" or "Functioning-At-Risk". The latter evaluation is primarily due to lingering flood effect – 1964, 1997, 2006 – with channels demonstrating long-term natural recovery.

An example of "Functioning-At-Risk" within Coho CH is **Tompkins Creek** mainstem. Flood scour impacted the channel and reduced banks in many places to boulder and large cobble. While these substrates are good components in regards to bank stability, flood also affected the very steep and high banks present along the stream. These locations continue to exhibit raveling and other signs of active erosion, particularly following spring run-off. The 2000 Lower Scott River Ecosystem Assessment found Tompkins Creek to be "Not Properly Functioning", but that determination was based upon surveys conducted in 1997, less than a season following the flood. Since then, most banks have stabilized and revegetated, but segments of raw bank persist. Additional to flood impact, there are several short segments where the road which parallels the creek affects the stream, including the banks, although the overall amount is small because the road is typically set back at least 100 feet.

Grider Creek Coho CH, in contrast to Tompkins Creek, is "Properly Functioning". The Grider Creek channel has also been affected by flood. However, because the valley walls tend to be set back from the creek, there are few instances of high, actively erosive banks raveling material directly into the stream. Otherwise, streambanks are comprised of bedrock/boulder/cobble substrate which is resistant to high water events, and riparian vegetation has recovered from past flood scour. Except for access to private property and a campground within the lower three miles of Grider Creek, Grider Creek is largely roadless. The road that follows lower Grider Creek is set back far enough from the channel that it does not affect streambanks.

Streambanks in most aquatic emphasis areas are considered to be in good condition (USFS 2014b; pers. obs.). Banks are well vegetated, with minimal erosion; and in many places a thick streamside alder component restricts animal access as well as provides for bank stability. An exception is Faulkstein Meadow (Middle Tompkins Allotment), where an active headcut is present, along with other channel adjustments and signs of past stabilization efforts. The headcut is unlikely to have initiated due to livestock. While no definitive history on the headcut is available, evidence suggests that historic timber harvest practices, such as using stream channel for skidding, may be responsible. However, it is possible that past livestock use may have enhanced or exasperated the headcut.

Post-Project Condition

Proximity and Probability

There is no overlap of Coho occupation or CH with aquatic emphasis areas.

Middle Tompkins Allotment does include both Coho and CH upon mainstem Tompkins Creek within the allotment boundary. However, the stream has been impacted from past flood events, exposing and/or creating banks largely comprised of cobbles and boulders (**Photo 4**). Bedrock is also an intermittent component of the Tompkins Creek streambank. As cattle tend to avoid these substrate types where possible, access to the water is restricted; and while the occasional animal may enter Tompkins Creek, these substrates armor the bank against damage.

During the 2014 Happy Camp Complex, several small alder adjacent to the 46N64 bridge over Tompkins Creek were cut to facilitate water tender access to the stream. Prior to the fire, the density of these alder lessened the probability that cattle would cross the creek beside the bridge, instead of on the bridge, when being herded between Middle Tompkins Allotment pastures. Until the alder recover, there is an increased possibility that livestock will trail through the creek during relocation herding, thereby impacting streambanks as animals enter and exit the water.

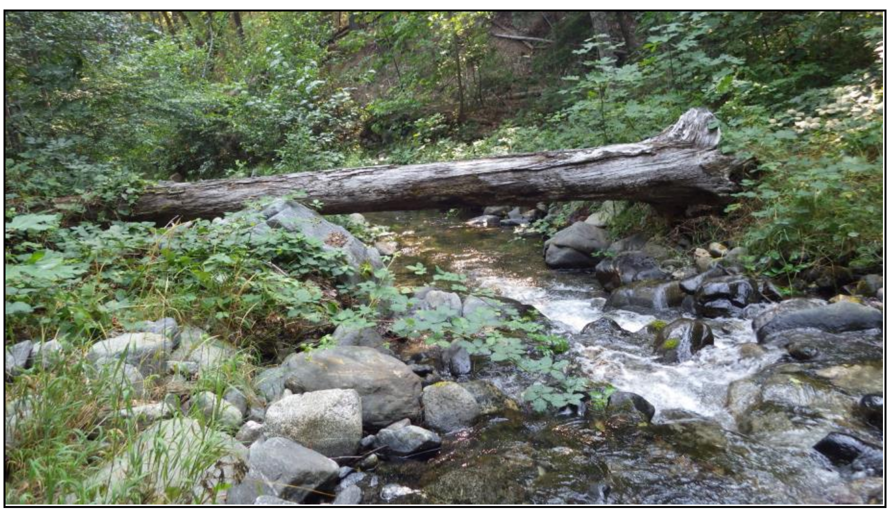


Photo 4. Mainstem Tompkins Creek in vicinity of the corral at the NMFS monitoring photo point site. Note the bank composition of large rock, which is typical throughout the anadromous reach. Photo taken in August 2013.

Magnitude

Except for the 46N64 road crossing, no streambank impacts within Coho CH is expected. While there is potential for localized bank impact within aquatic emphasis areas, impacts will not propagate downstream to CH due to channel stability afforded from geology, wood debris, or existing vegetation (i.e., alder and willow). Upon Tompkins Creek, access to the mainstem is limited and substrate armors the bank from livestock damage. The exception is the 46N64 bridge due to removal of alder during fire suppression activities. Until the alder recovers to its pre-fire condition, livestock may be more likely to cross the creek directly, instead of utilizing the bridge, when being herded across the allotment. However, the effect to the streambanks will be localized and limited to when animals are being actively moved/herded.

--Watershed Condition: Disturbance History and Regime--

This Indicator is primarily rated using CWE (ERA/USLE/GEO) models. If professional judgment concludes that these models are not fully capturing disturbance risk, road density and location, current impacts from past stand-replacing timber harvest and wildfire, fire regime, vegetation regime, and development on private property may also be considered (Appendix C).

Current Condition

Both Lake Mountain Allotment and Middle Tompkins Allotment include a history of livestock use (see "Existing Environment" section). The latter has not been grazed since 2007. Other disturbances within the Project area include those of human origin (e.g., timber harvest, fire suppression, fuels manipulation, water diversions, mining, and road construction) and natural (e.g., flood, wildfire, geology). While existing KNF cumulative watershed effects (CWE) models capture many landscape area impacts which include an element of ground disturbance, livestock is not included due to diffuse nature of effects and subsequent difficulty of including such in model calculations.

The ERA, USLE, and GEO models track various aspects of human and natural impacts upon the landscape and geologic environment. ERA ("Equivalent Roaded Area") provides an accounting system for tracking disturbances that affect watershed processes, in particular changes in peak runoff flows influenced by ground disturbing activities; USLE ("Universal Soil Loss Equation") tracks surface erosion and sediment delivery in the first year following project completion; and GEO estimates sediment delivery from mass wasting (i.e., landslide events) for the first decade after project completion. A threshold of "1" generally indicates an elevated risk of impact from a given model. This is not the point at which significant effects occur, but a yellow flag indicating that additional impacts need to be considered for resource degradation. Due to its diffuse nature, grazing is generally not tracked by these models. However, this Project did need to account for grazing use upon the landscape, and, therefore, modification to model calculation did occur. A brief explanation is provided later in this Indicator discussion, as well can be found in the Hydrology Report.

A "Properly Functioning" disturbance regime includes stable natural processes and hydrograph, where high quality habitat and watershed complexity provides refuge and rearing for all life stages or multiple life-history forms; and all three cumulative watershed models should be below the "1" threshold. Alternately, for a "Functioning-At-Risk" disturbance regime, the frequency, duration, and magnitude of disturbance events have the potential to be moderately departed from the reference condition due to human-mediated or other landscape scale impacts upon the watershed; and one or two of the models may be over threshold. Finally, a "Not Properly Functioning" disturbance regime is described as a watershed with disturbance events significantly departed from reference condition as a consequence of past/current human activities or other influences; and all three models are over threshold. See **Appendix C** for additional CWE information.

All drainages in the Project area were affected to some extent by the 2014 Happy Camp Complex. Post-fire, four 7^{th}-field watersheds are "Properly Functioning" and five are "Functioning-At-Risk" (**Table 10**). Prior to the fire, two drainages – Deep Creek-Scott River, O'Neil Creek – were "Functioning-At-Risk" via modeling; with Tompkins Creek joining due to professional judgment. Deep Creek-Scott River was elevated in regards to the GEO component, which was due to geology, wildfire, and past timber harvest. In contrast, O'Neil Creek was just barely over threshold for the USLE component, the reason of which was not immediately clear, but was perhaps related to management decisions which have occurred within the drainage. On the other hand, **Thompkins Creek** drainage is a special case. Although the CWE models are all below threshold (including pre- and post-fire), professional judgment that past and current impacts related to timber harvest, roads, flood, and the interactions between these and other elements suggest the watershed is better represented by a "Functioning-At-Risk" category.

Post-Project Condition

Proximity and Probability

Livestock grazing does not affect either USLE or GEO models (Bell, pers. comm). These models are impacted by major ground disturbing activities, loss of large tree root structure, and loss of precipitation interception by vegetation. However, the Project neither proposes tree removal nor extensive ground disturbance, and nor will the level of grazing approach the point where herbaceous and brush species are detrimentally affected on a landscape level. Therefore, while several watersheds exhibit a USLE or GEO model over the "1" threshold, these deficits are either due to natural or human caused impacts. Livestock use will not increase these model values.

Grazing potentially affects existing Forest ERA models. However, the effect is often too small to be meaningfully detected from background variation and inherent model error. ERA model adjustments made for this Project occur in conjunction with concentrated use areas because these are the locations which would undergo the degree of compaction and ground disturbance to which the model is sensitive (USFS 2014b).

The current condition for Lake Mountain is an active allotment. Therefore, the **Table 10** ERA model baseline for this allotment has been adjusted to include grazing. The proposed action to reauthorize grazing within this allotment will use the same HMs. Although actions will be taken to improve livestock distribution in regards to the high-use area, the percentage of allotment this location represents is too small to cause a measurable change in the ERA model. Overall, no Lake Mountain Allotment watersheds are over the "1" threshold.

The current condition for Middle Tompkins is a vacant allotment (ungrazed since 2007). Therefore, pre-Project ERA model baseline (**Table 10**) is depicted as complete recovery from grazing. The resumption of grazing, using historic high- and moderate-use distribution, shows the minimal effect upon the landscape between the "no grazing" and "grazing" condition. The seeming increase to the Tompkins Creek watershed risk is a result of rounding: baseline/Project model difference is 0.002, which is similar to the other allotment watersheds and much too small to translate to an on-the-ground effect to discharge or other habitat values. In actuality, ERA model differences between pre- and post-Project may even be smaller than those calculated. The baseline assumption of complete recovery is for illustrative purposes only as it is unlikely that higher use areas will have had sufficient rest to allow natural processes to decompact soils due to the allotment's long grazing history (Greenwood and McKenzie 2001; Drewey 2006). Overall, no Middle Tompkins Allotment watersheds are over the "1" threshold.

Magnitude
In summary, grazing will have no effect to existing disturbance indices as reflected in by CWE modeling. All ERA models are below the "1" threshold; and while several watersheds have a USLE or GEO baseline over the threshold, grazing will not cause additional impact.

Table 10. Baseline and post-Project cumulative watershed effects. Risks over the "1" threshold are bolded.

Watershed	Acres	Baseline (post-fire)				Post -Project		
		ERA	%ERA	TOC	Risk	ERA	%ERA	Risk
7th-Field Watershed(s)								
Deep Creek-Scott River[1]	3798	149.8	3.9%	9.0%	0.44	*No conc. use areas*		
McCarthy Creek-Scott River[1]	11680	555.4	4.8%	9.5%	0.50	555.6	4.8%	0.50
Middle Creek[1]	4498	264.4	5.9%	8.5%	0.69	265.6	5.9%	0.69
Tompkins Creek[1,3]	9327	380.8	4.1%	7.5%	0.54	382.3	4.1%	0.55
O'Neil Creek[2]	2429	155.9	6.4%	8.0%	0.80	*No change to baseline*		
Rancheria Creek[2]	4374	269.5	6.2%	7.0%	0.88	*No change to baseline*		
Tom Martin Creek-Klamath River[2]	10690	518.1	4.8%	9.0%	0.54	*No change to baseline*		
Schutts Gulch-Klamath River[2]	6692	356.2	5.3%	9.0%	0.59	*No change to baseline*		
Upper Grider Creek[2]	8467	261.3	3.1%	7.5%	0.41	*No change to baseline*		
5th-Field Watershed(s)								
Lower Scott River	97600	4651	4.6%	8.6%	0.55	*No measurable change*		
Seiad Creek-Klamath River	81706	3715	4.5%	8.3%	0.55	*No measurable change*		

[1]Middle Tompkins Allotment - existing KNF baseline used; post-Project adjusted to illustrate minimal change due to resumption of grazing
[2]Lake Mountain Allotment - baseline adjusted to include grazing
[3]Increase to Tompkins Creek risk output is due to rounding. Actual calculated change to risk is 0.002 difference, which is too small to translate to on-the-ground effect to discharge or other habitat values.

Watershed	Acres	Baseline (post-fire)		Post-Project	
		USLE Risk	GEO Risk	USLE Risk	GEO Risk
7th-Field Watershed(s)					
Deep Creek-Scott River	3798	0.52	**1.39**	*Models not affected by grazing*	
McCarthy Creek-Scott River	11680	0.48	0.43		
Middle Creek	4498	0.87	**1.09**		
Tompkins Creek	9327	0.86	0.85		
O'Neil Creek	2429	**1.37**	**1.50**	*Models not affected by grazing*	
Rancheria Creek	4374	**1.14**	0.68		
Tom Martin Creek-Klamath River	10690	0.78	0.44		
Schutts Gulch-Klamath River	6692	0.71	**1.15**		
Upper Grider Creek	8467	0.50	0.31		
5th-Field Watershed(s)					
Lower Scott River	97600	0.48	0.57	*Models not affected by grazing*	
Seiad Creek-Klamath River	81706	0.68	0.82		

--Flow/Hydrology: Peak/Base Flows--

For watershed-level, this Indicator is rated using elements of ERA, road density, vegetation and RR condition, and other associated components (Appendix C). Any potential effects to flows due to a site-specific Project element are considered individually.

Current Condition

The determination of existing condition for peak/base flows is a synthesis of ERA, road density, and vegetation condition.

Most 7th-field watersheds within the Project area are considered "Properly Functioning", with the following exceptions:

- O'Neil Creek – "Functioning-At-Risk" – Although the ERA model is below critical threshold, the existing road density is high (greater than 3 miles per square mile), particularly in the headwaters (USFS 1999c). Due to the history of the area, including mining and timber harvest, additional abandoned roads are also expected to be present upon the landscape. Riparian vegetation is good, but is likely still recovering from past flood impacts.
- Tompkins Creek – "Functioning-At-Risk" – Although the ERA model is below critical threshold, the existing road density is moderate (USFS 2000). Of particular interest, a diversion is present on Tompkins Creek just below the Tompkins Creek Corral. The diversion redirects water to private property downstream of the Project area. It is believed that diversion operation may have recently changed (e.g., within last five years). In contrast to past notes and surveys associated with Tompkins Creek not expressing concern with flow due to diversion operation, observations made in the last several years haven noticed changes. For example, up to 80% of stream flow was diverted during the 2014 summer (pers. obs.); and the 2013 Coho spawning season saw fish preferentially attracted to the diversion outflow at the Scott River because insufficient water was flowing through the Tompkins Creek channel (M. Knechtle, pers. comm.).

Post-Project Condition

Proximity and Probability

At the site level, there will be no change in peak/base flows as a result of Project activities. The private property users of the Tompkins Creek diversion do not graze livestock on Forest, and nor are they associated with allotment permittees. Therefore, there will be no change in diversion amount nor season of use for Tompkins Creek as a result of this Project. Elsewhere in the Project area, no diversions will be built.

On the watershed-scale, the ERA model can be used in a generalized manner to consider a Project impacts to flow. A risk level of "1" is the interference threshold point at which flow impacts may be starting to occur. As the ERA risk level is below "1" for all Project watersheds, no changes in peak/base flow are expected (see "Disturbance History and Regime" subsection).

Magnitude

There will be no change to peak/base flows, either at site level or watershed-scale, due to the Project.

VI. Cumulative Effects – ESA

The ESA defines cumulative effects in 50 C.F.R. 402.02 as "those effects of future State or private activities, not involving Federal Activities that are reasonably certain to occur within the Action Area of the Federal action subject to consultation." The AP (on page 42) explains that, "if the effect determination is NLAA, an assessment of ESA cumulative effects is not required by the regulations…." There are no future foreseeable actions on State or private lands within the Project Action Area (note: There are no state lands and very few private lands within the Project action area). There are no actions that have ESA Determinations of "May Affect, Likely-to-Adversely-Affect" Coho salmon occurring or under ESA consultation within the Action Area. Therefore, a cumulative effects analysis for ESA is not provided. Future Federal actions that have not already been consulted on will be analyzed through separate Section 7 consultations.

VII. Species and Habitat – Direct/Indirect Effects and Project Element Summary

Direct Effects:

There will be no direct effects to Coho as a result of the project because the potential for overlap between grazing and SONCC Coho salmon CH is limited to Tompkins Creek at the 46N64 bridge crossing, where active livestock herding, topographic barriers to livestock movement, and a general lack of forage are expected to preclude impacts to any juvenile Coho salmon that might be present.

Indirect Effects:

Element Summary (as supported by Section V)

The Project elements considered for this analysis include livestock grazing, adaptive management strategy, livestock transportation, monitoring, and exclosure construction.

Livestock Grazing

This PE includes livestock grazing, as well as the active herding of animals within allotments and between pastures. Focus was upon aquatic emphasis areas – locations with concentrated livestock use where animals have access to streams which are actually or potentially connected to fish habitat. Most Indicators for this element have no effect because there is no overlap of aquatic emphasis areas with Coho or Critical Habitat, with the closest site 1.9 miles from CH. While the potential for overlap exists in regards to Tompkins Creek mainstem within the Middle Tompkins allotment, this location is not attractive because of sparse forage and extreme difficulty in accessing water. Indicators that may be affected by project grazing are temperature, turbidity/substrate, nutrients, streambank condition, peak/base flows, and disturbance history/regime. The analysis describes how localized effects to these indicators are not likely to result in effects to downstream fish-bearing habitat and CH.

The remaining PEs have no effect to Coho or Critical Habitat:

Adaptive Management Strategy

Permit administration has no direct mechanism to affect Coho or Critical Habitat

Allotment Boundary Adjustment
Allotment boundary adjustment is an administrative exercise with no direct mechanism to affect Coho or Critical Habitat. Proposed boundaries capture areas of actual utilization by livestock and no new areas will be opened to use.

Livestock Transportation
Livestock transportation to and from allotments is via standard cattle/horse trailers. Animals do not have the opportunity to wander and access water and forage as might occur if they were being herded to pasture from an off-Forest location. Therefore, impact of transportation is no more than would be expected given general vehicle use upon the KNF road system. Herding of cattle within allotments and between pastures is considered under "Livestock Grazing".

Monitoring
Monitoring involve minimally invasive, non-mechanized instream work that is outside of Critical Habitat and will not result in downstream effects to Coho.

Lookout Spring Redevelopment
Redevelopment of Lookout Spring will involve minimal degree of non-mechanized ground disturbance distant from Coho or Critical Habitat (more than 4.0 miles). There is no surface connection between spring outflow and Kuntz Creek.

Faulkstein Camp Meadow Headcut Exclosure
Exclosure fence construction at Faulkstein Camp Meadow is distant from Coho or Critical Habitat (about 2.5 miles) and will not include ground disturbance.

The following conclusions, with consideration of the effects from Project Elements to Habitat Indicators, lead to my final determination of effects that the proposed project will have on Threatened Coho salmon, CH, and EFH:

1) Concentrated livestock use occurs in fishless headwater systems distant from occupation by anadromous species. Although Tompkins Creek potentially includes overlap of livestock use within Coho-occupied areas, topographic barriers and general lack of forage deter casual use. Monitoring and observations by KNF personnel indicate that the mainstem is not utilized by cattle when the Middle Tompkins Allotment has been active.

2) All habitat Indicators for anadromous fish and CH described in the AP document and analyzed in this BA will be neutral, discountable, or changed insignificantly by implementation of the PEs. Where changes to Indicators occur, they are not to the magnitude where the functioning ability of any of the Habitat Indicators is changed.

3) Resource protection measures, including BMPs and livestock permit restrictions, will be utilized to minimize effects of the proposed project to anadromous fish and their habitat to insignificant levels in the short- and long-term.

PROJECT EFFECTS DETERMINATION KEY FOR SPECIES AND DESIGNATED CRITICAL HABITAT		
1)	Do any of the Indicator summaries have a positive (+) or negative (-) conclusion?	
		Yes – Go to 2
		No – No Effect
2)	Are the Indicator summary results only positive?	
		Yes – NLAA
		No – Go to 3
3)	If any of the Indicator summary results are negative, are the effects insignificant or discountable?	
		Yes – NLAA
		No – LAA, fill out Adverse Effects Form

VIIIa. Determination – ESA Species

Taking all analysis into consideration, it is the determination of the Fish Biologist that the Lake Mountain and Middle Tompkins Allotment Management Plan may affect, but is not likely to adversely affect SONCC Coho salmon; and may affect, but is not likely to adversely affect its designated Critical Habitat.

VIIIb. Determination – EFH Assessment

KNF stream surveys, California Department of Fish and Wildlife information and professional judgment of fisheries biologists has been compiled into the KNF steelhead trout distribution layer in the KNF Geographic Information Systems electronic library. The use of the KNF steelhead trout distribution to define SONCC Coho salmon and UKTR spring and fall-run Chinook salmon EFH is a conservative estimate of the distribution of SONCC Coho salmon and UKTR Chinook salmon because their distribution is likely somewhat less extensive than steelhead trout due to differences in swimming and jumping abilities. The maximum jumping height for Coho salmon is 2.2 meters, while for Chinook salmon it is 2.4 meters, and for steelhead it is 3.4 meters (Meehan 1991). Therefore, steelhead trout can access more habitat than Coho or Chinook salmon (e.g., steelhead trout can make a 3 meter jump to migrate up a stream, but Coho and Chinook salmon cannot. Because Coho and Chinook salmon demonstrate a similar ability to access habitat, EFH for the Project is considered synonymous with Coho distribution within the Project area.

The effects analysis considers effects to Pacific salmonid habitat in general; and since habitat requirements for Coho and Chinook salmon are similar, the effects of the Project as described above for Coho salmon CH are identical for EFH.

Taking all analysis into consideration, it is the determination of the Fish Biologist that the Lake Mountain and Middle Tompkins Allotment Management Plan may adversely affect EFH.

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Personal Communication

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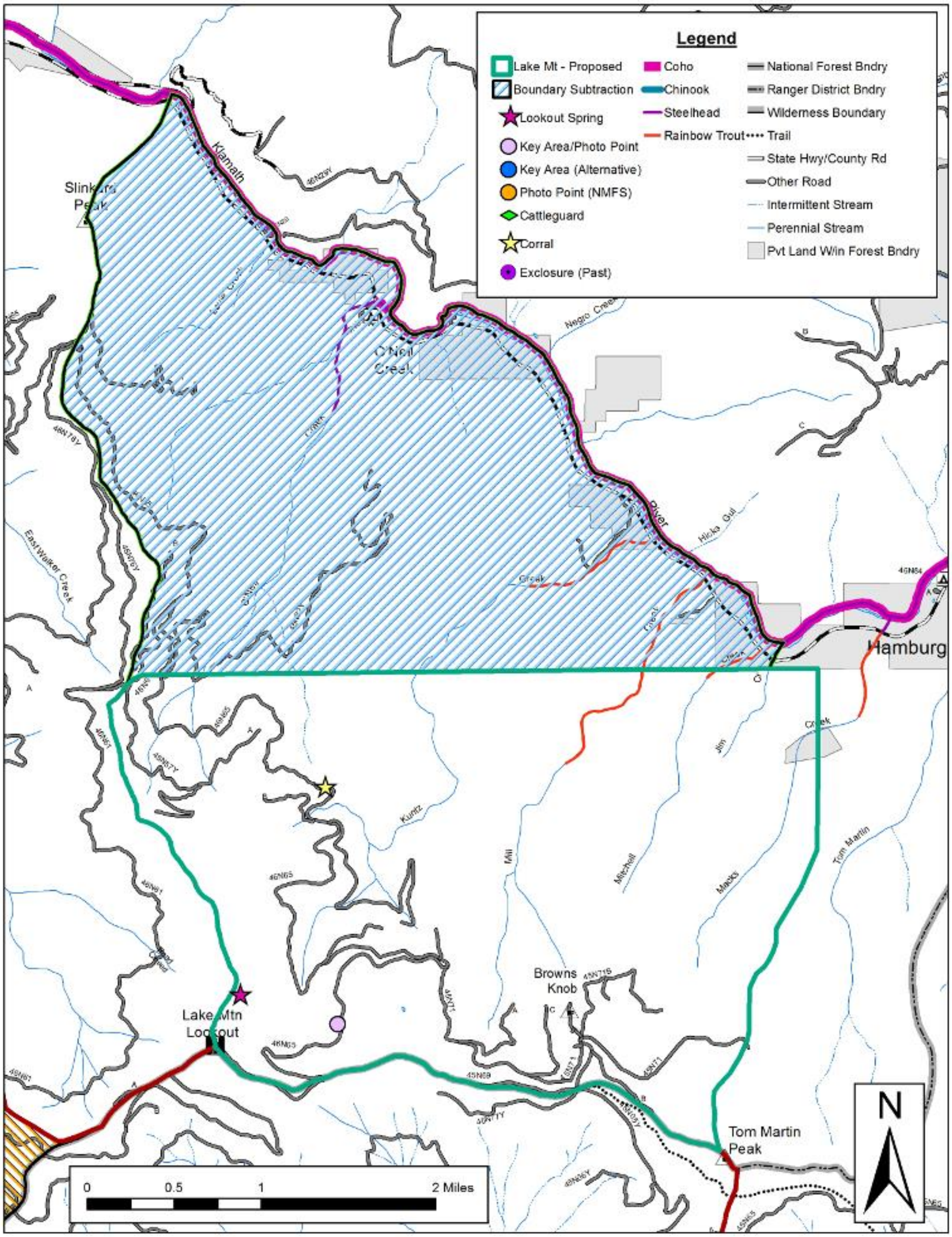
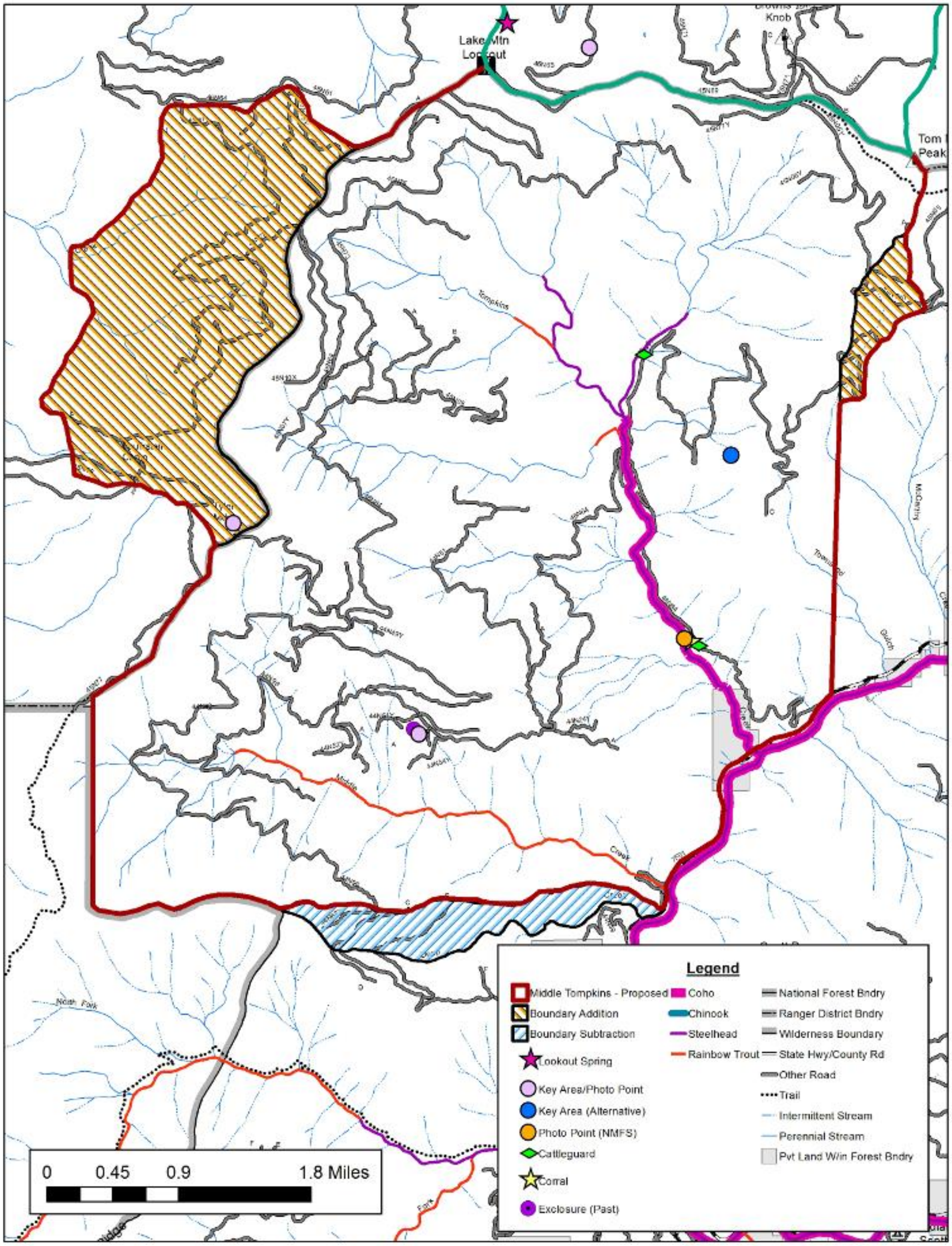
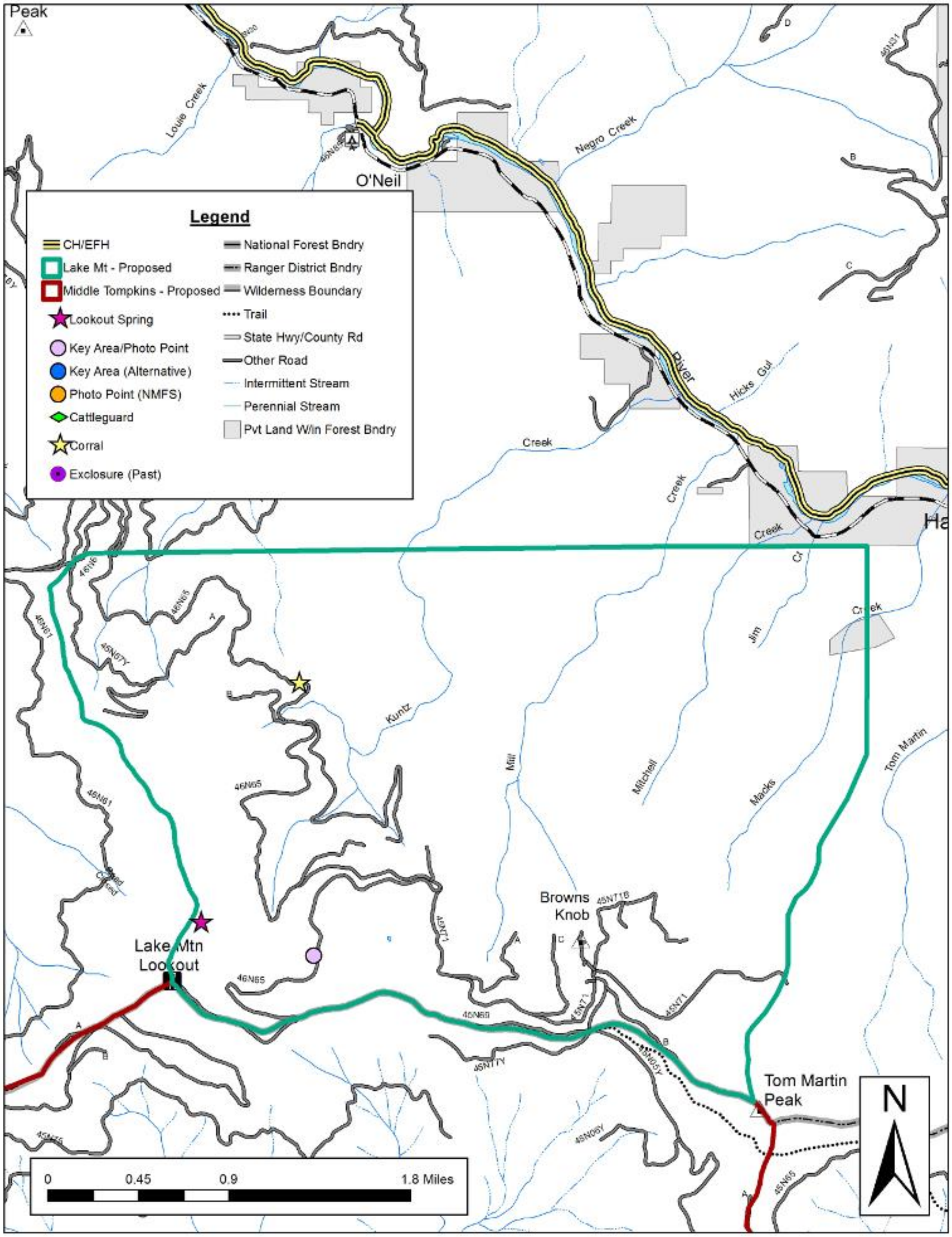
Appendix A. Project Maps



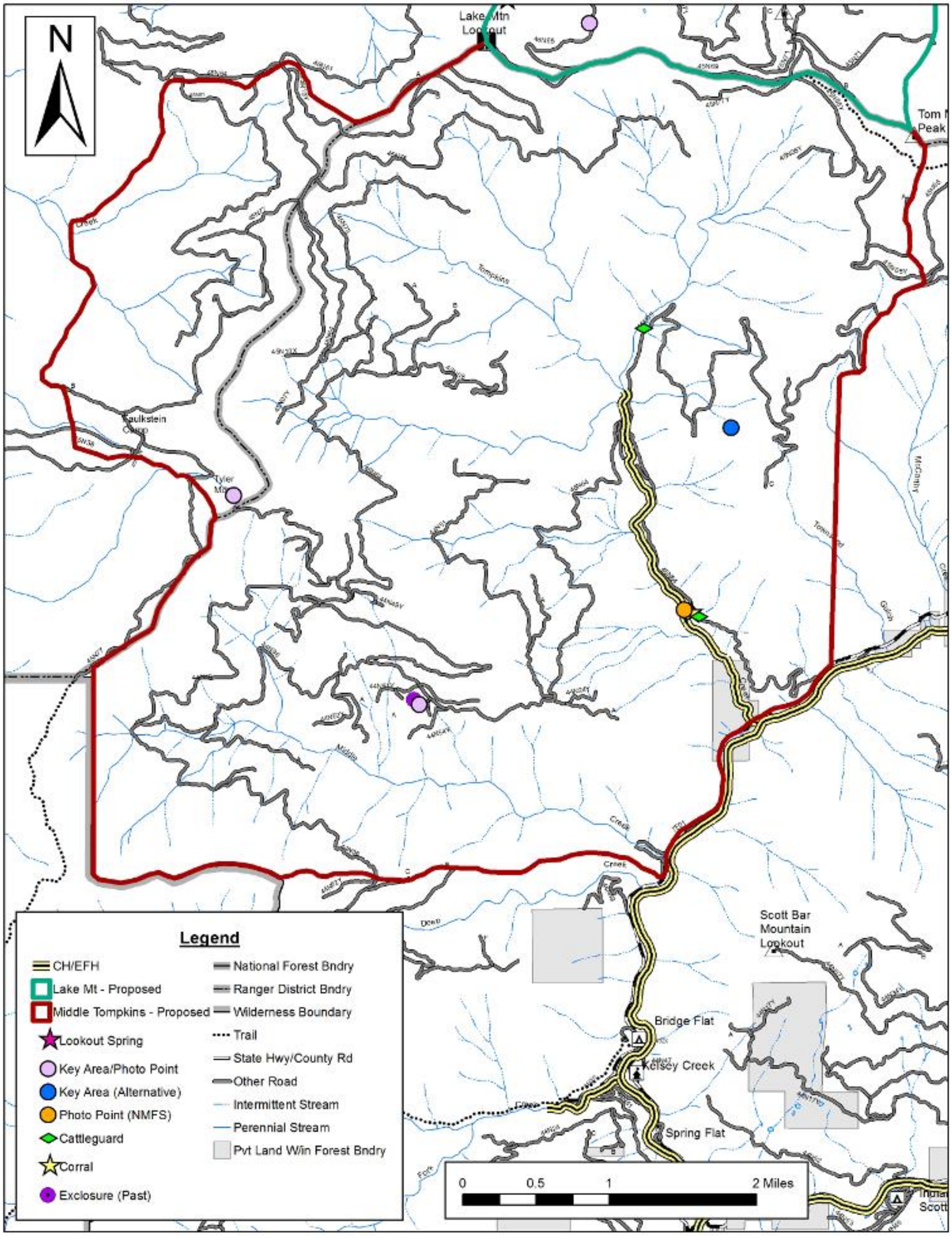
Map A-1. Aquatic resources (salmonids) distribution within and nearby the <u>Lake Mountain Allotment</u> of the Lake Mountain/Middle Tompkins Project. Map includes proposed Project elements of boundary adjustment (crosshatched area excluded from Project), Lookout Spring, and monitoring locations.



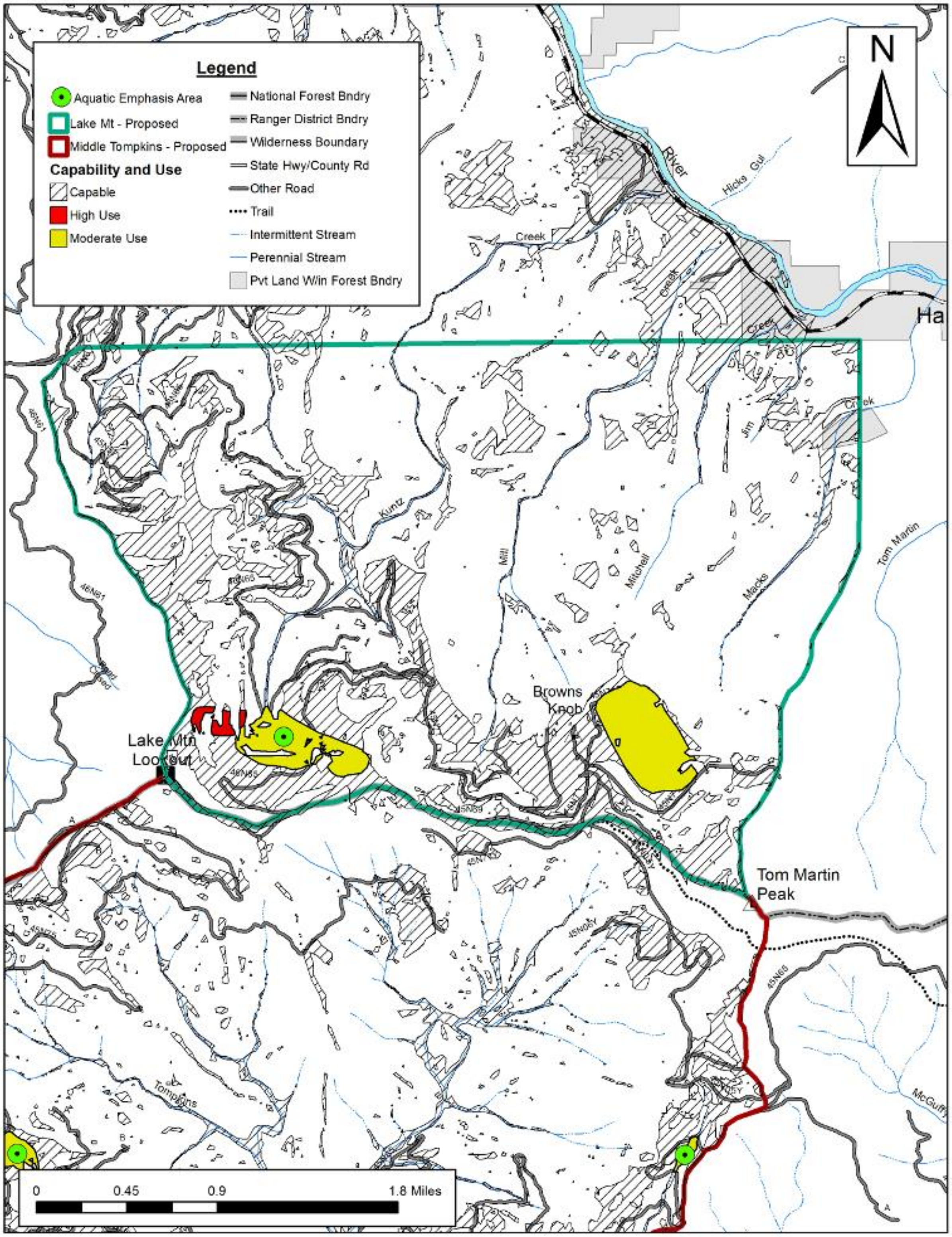
Map A-2. Aquatic resources (salmonids) distribution within and nearby the <u>Middle Tompkins Allotment</u> of the Lake Mountain/Middle Tompkins Project. Map includes proposed Project elements of boundary adjustment (crosshatched area included or excluded from Project), monitoring locations, and other important locations or structures within the allotment.



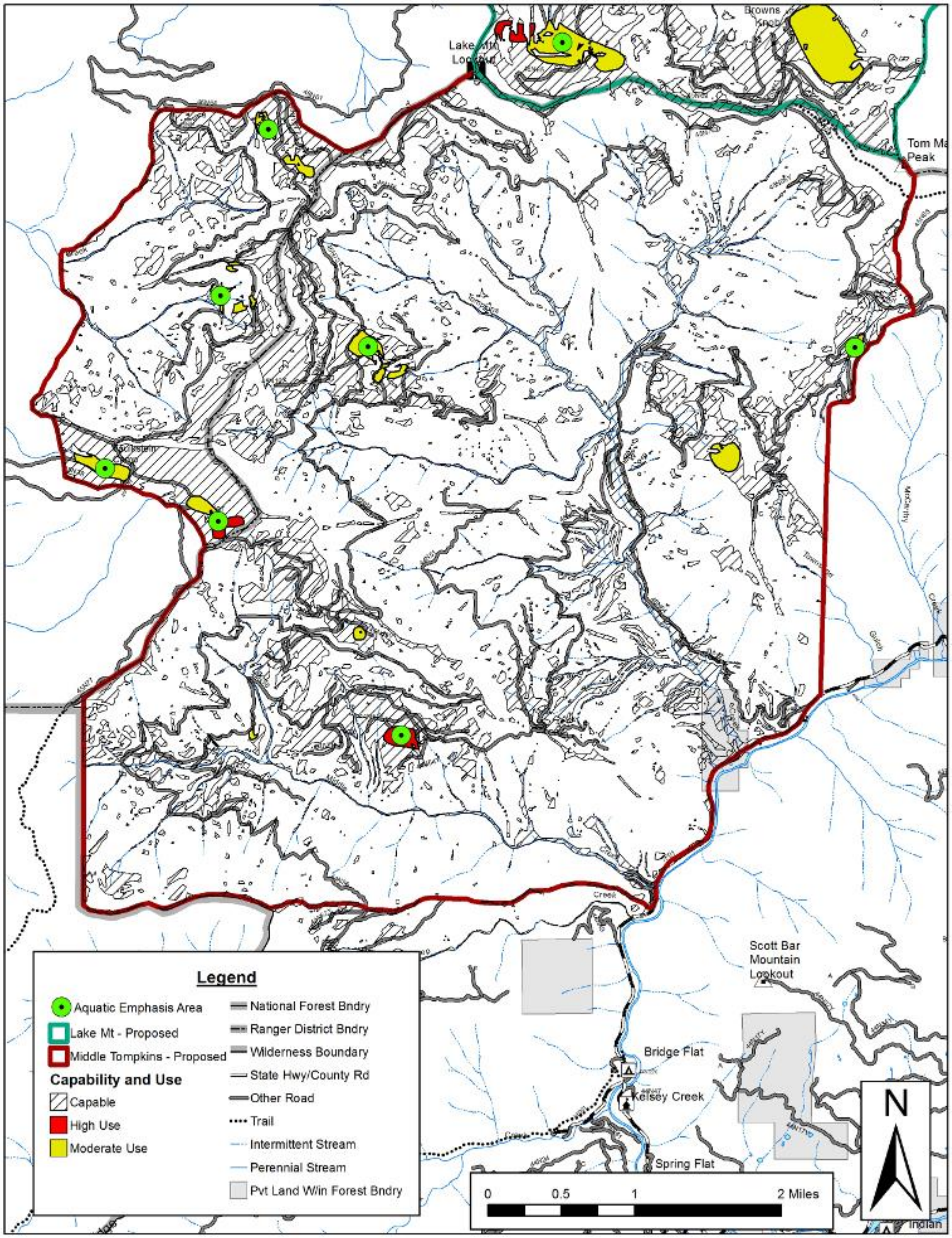
Map A-3. Essential Fish Habitat (i.e., mainstem Klamath River) extent for the <u>Lake Mountain Allotment</u> of the Lake Mountain/Middle Tompkins Project. See Appendix F for further discussion. Includes proposed Project elements of proposed boundary, monitoring locations, and other important locales/structures within the allotment.



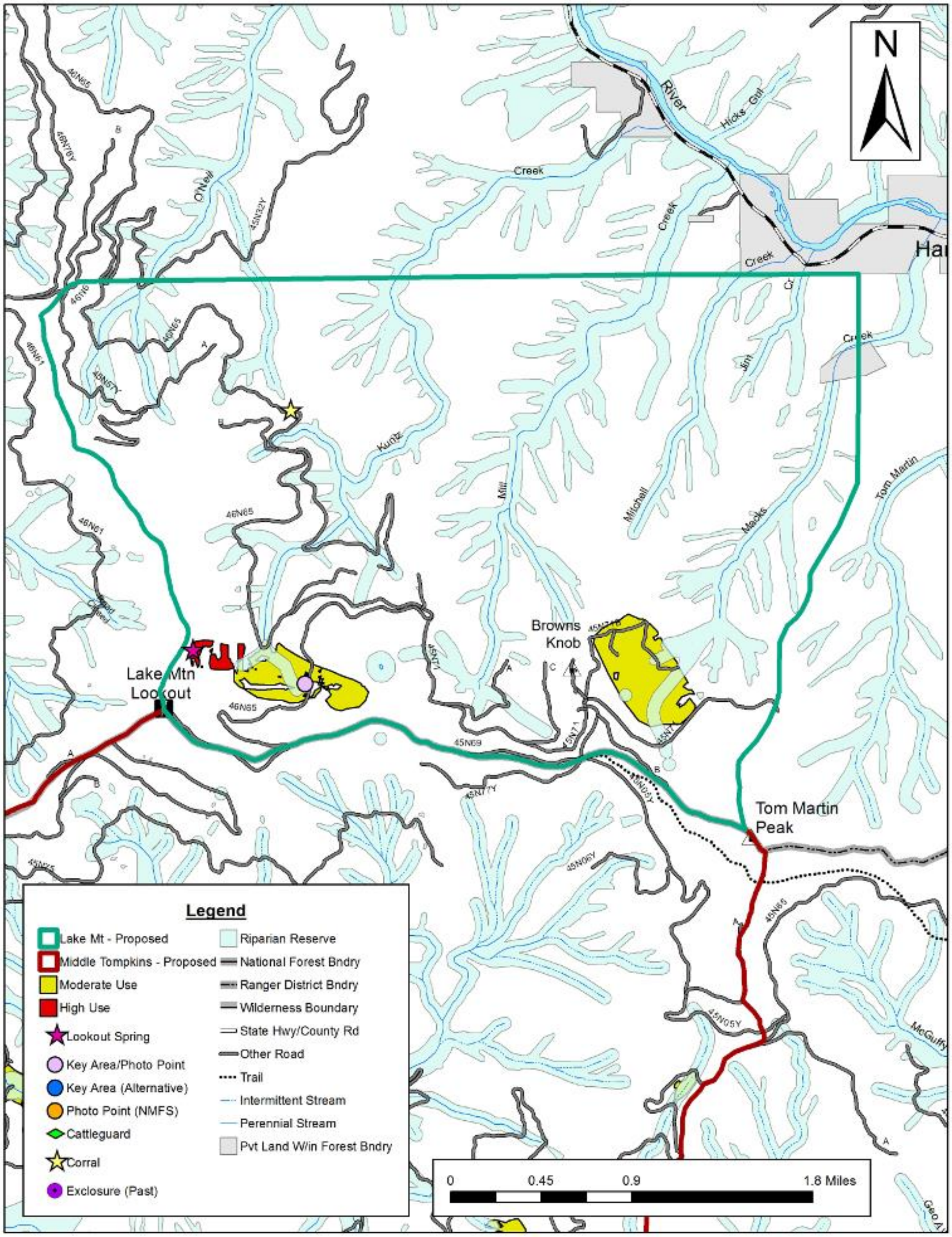
Map A-4. Essential Fish Habitat extent (i.e., mainstem Scott River and lower Tompkins Creek) for the <u>Middle Tompkins Allotment</u> of the Lake Mountain/Middle Tompkins Project. See Appendix F for further discussion. Includes proposed Project elements of proposed boundary, monitoring locations, and other important locales/structures within the allotment.



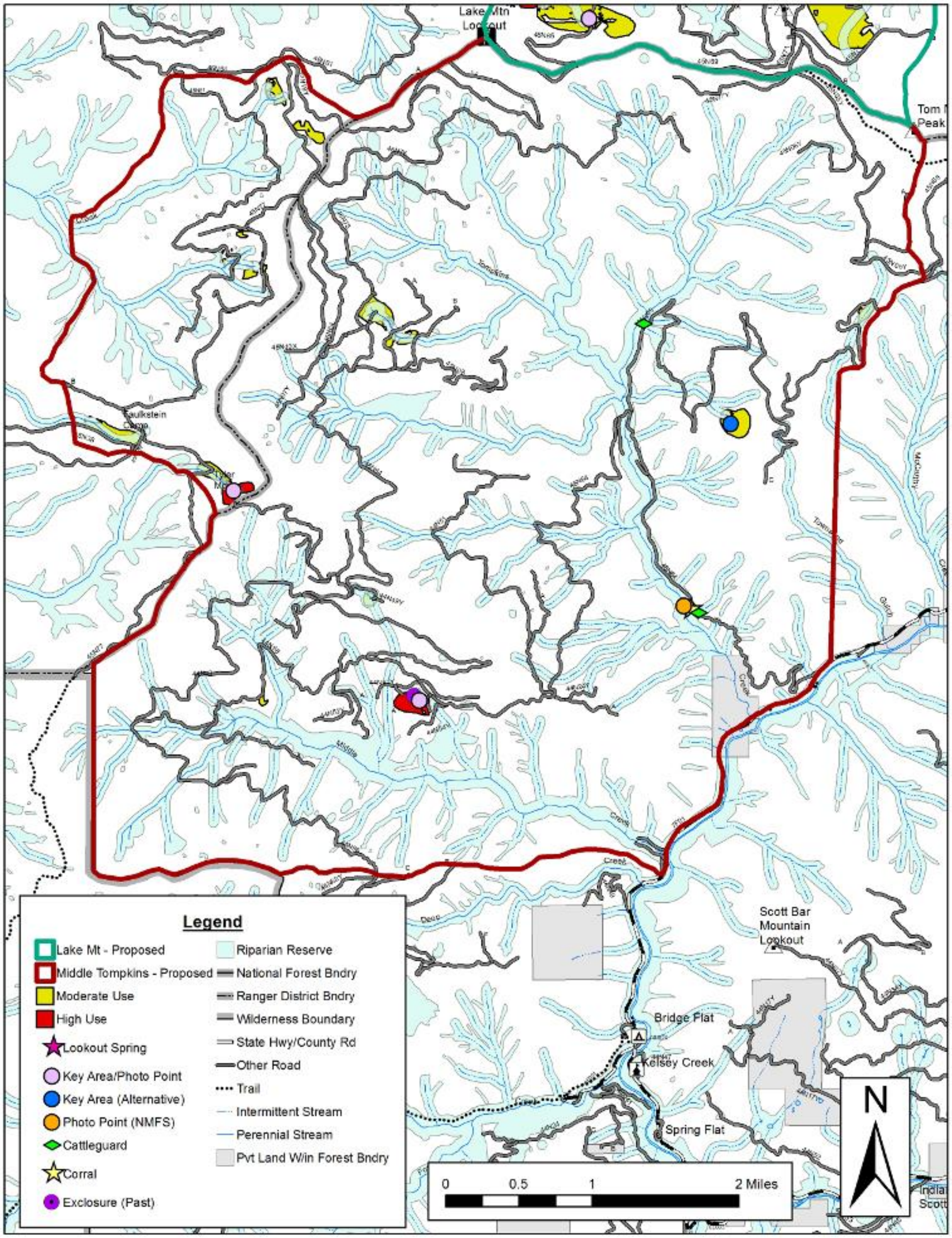
Map A-5. Capability, including moderate and high concentrate use, and sites corresponding to aquatic emphasis areas for the Lake Mountain Allotment of the Lake Mountain/Middle Tompkins Project. Display is only within proposed allotment boundary.



Map A-6. Capability, including moderate and high concentrate use, and sites corresponding to aquatic emphasis areas for the Middle Tompkins Allotment of the Lake Mountain/Middle Tompkins Project. Display is only within proposed allotment boundary.



Map A-7. Riparian Reserves (hydrologic and geologic) and concentrated use areas for the Middle Tompkins Allotment of the Lake Mountain/Middle Tompkins Project. Display is only within proposed allotment boundary.



Map A-8. Riparian Reserves (hydrologic and geologic) and concentrated use areas for the Middle Tompkins Allotment of the Lake Mountain/Middle Tompkins Project. Display is only within proposed allotment boundary.

Appendix B. Brief Description of Concentrated Use Areas

This appendix provides a brief description of each concentrated use area within the Lake Mountain Allotment and Middle Tompkins Allotment project area. Aquatic emphasis areas are discussed, as well as other locations. Most meadows, complexes, and concentrated use areas do not have formal place names. Except for Middle Meadow and Tyler Meadows, all names are as used by KNF range personnel and other staff.

Lake Mountain Allotment

Aquatic Emphasis Areas

Kuntz Meadow

Located at the headwaters of Kuntz Creek. Consists of dry to moist hillslope meadow with large inclusions of dense alder. Alder provides excellent streambank protection where it occurs, as does embedded rock. Hillslope gradient increases and the valley form narrows at the base of the meadow, creating a single stream channel. Stream is perennial. Distance to Coho Critical Habitat (in Klamath River) is 4.0 miles.

Of particular interest within the Kuntz Meadow area is Lookout Spring. This spring area tends to exhibit higher use compared to the meadow due to proximity of both water and forage. There is no surface connection of the spring to Kuntz Creek – once water leaves the small pond associated with the spring, it soaks into hillslope soils.

Kuntz Meadow at established photo point (July 2013)

Small pond feature at Lookout Spring (August 2012)

Other Concentrated Use Areas

Browns Knob Complex

Located at the headwaters of Macks Creek. Consists of a broad area of plantations, vegetation manipulated via past logging activity, and natural openings. General hillslope gradient within the bowl is less than elsewhere in the vicinity. While small seeps and springs may be present, surface expression remains relatively near its source and there is no direct connection to Macks Creek.

Because the Browns Knob concentrated use area does not connect to fish habitat, it is not considered to be an aquatic emphasis area.

Middle Tompkins Allotment

Aquatic Emphasis Areas

Tompkins Meadow Complex

Located at the headwaters of an unnamed tributary to Tompkins Creek. Consists of a series of open areas and stringer meadows. Natural extent of open meadow area likely enhanced in the past due to activities relating to timber harvest access and landing use. Primary water feature is a drafting pond constructed upstream of an abandoned road crossing. Streambanks, particularly in steeper gradient areas, are well protected due to dense thickets of alder or willow. Willow form in meadow areas is good and shows little to no indication of past overutilization by livestock. Willow do show some current browse from large game species. Stream is perennial. Distance to Coho Critical Habitat (in Tompkins Creek) is 1.9 miles.

Pond at Tompkins Meadow Complex (October 2012)

One of the small meadows within the Tompkins Meadow Complex (October 2012)

Alder cover downstream of pond (May 2014)

Faulkstein Camp Meadow
Located in the headwaters of Fish Creek. Elongated meadow area that appears to have additional historic impacts due to use as a skid and/or access trail for logging. A headcut is present midway through the meadow, although agent of origination is not apparent. Channel is actively adjusting throughout the meadow, with woody debris acting as local controls. Downstream of the meadow, gradient steepens and the channel is well stabilized by wood; and little to no vegetation characteristic of "riparian" (e.g., willow) is present. Stream is considered to be perennial, although short segments within the meadow itself may dry during baseflow conditions. Distance to Coho Critical Habitat (in Grider Creek) is 2.5 miles.


Meadow headcut (May 2014)


Stream channel downstream of meadow (May 2014)


Overview of Faulkstein Meadow (May 2014)

Tyler Meadows

Located at the headwaters of an unnamed tributary to Grider Creek, often referred to as "Tyler Meadows Creek". Large natural hillslope meadow. Dense thickets of alder and willow common in the upper third of the meadow. Additional dense alder is present at the bottom of the meadow where the meadow gives way to forest and the gradient slightly increases, providing excellent protection to streambanks. Few game/livestock crossings through alder between meadow and road. A single small pond is present in the meadow. Streambanks not protected by alder/willow appear to be in good condition. Stream is perennial. Distance to Coho Critical Habitat (in Grider Creek) is 2.7 miles.

Overview of Tyler Meadows. Note alder clumps at the top of the meadow (October 2012)

Thick alder protecting channel at the lower portion of the meadow (May 2014)

Middle Meadow

Located at the headwaters of an unnamed tributary to Middle Creek. Large natural meadow which has additional historic impacts from logging, use as a fire camp, and off-road vehicles. Meadow has a moist to dry character, with the dryer portions of the meadow currently exhibiting conifer encroachment. The wetter area on the meadow east side consolidates into a channel which generally dries, or is intermittent pools, by mid-summer. Willows are found within the meadow area as scattered individuals or small clumps. The remains of an exclosure is present on the east side of the meadow. Below Middle Meadow, channel gradient is steep and appears to be well stabilized by woody debris. Grasses are present where slope and moisture allows, but no riparian brush species.

Status of an aquatic emphasis area is marginal. The channel which drains the meadow is mapped as ephemeral. However, on the ground it is difficult to determine if channel downstream the meadow is truly ephemeral, or if the character leans intermittent. To address this uncertainty concerning connectivity, Middle Meadow is thus designated an aquatic emphasis area. Distance to Coho Critical Habitat (in Scott River) is 2.3 miles.

Overview of Middle Meadow (April 2014)

Channel downstream of Middle Meadow (April 2014)

Rancheria Spring Complex
Located at the headwaters of Rancheria Creek and in the vicinity of Rancheria Spring. Multiple concentrated use areas, including dry hillslope in association with conifer plantations, as well as stringer meadows and steep hillslope spring/seep openings. Where forage areas are associated with springs/seeps, stream flow is *probably* perennial most years, although it may be a trickle during lowflow periods of summer and early fall. Distance to Coho Critical Habitat (in Grider Creek) is 4.5 miles.

Maple Spring Complex
Located at the headwaters of a tributary to Rancheria Creek and in the vicinity of Maple Spring. Multiple concentrated use areas, including dry hillslope in association with conifer plantations, as well as stringer meadows and steep hillslope spring/seep openings. Where forage areas are associated with springs/seeps, stream flow is *probably* perennial most years, although it may be a trickle during lowflow periods of summer and early fall. Distance to Coho Critical Habitat (in Grider Creek) is 4.0 miles.

McCarthy Meadow Complex
Located at the headwaters of an unnamed tributary to McCarthy Creek. A linear complex of stringer meadows and hardwood clumps located between two bends of Forest Road 45N65. Stream flow is considered to be intermittent. A drafting sump – likely origination is from past timber-related activities – serves as watering access for livestock. The pond has been observed to be dry most year by mid- to late-summer. Distance to Coho Critical Habitat (in Scott River) is 2.4 miles.

Other Concentrated Use Areas
Edie's Pond
Located at the headwaters of an unnamed tributary to Middle Creek. Edie's pond is an artificial structure, constructed to provide wildlife habitat and access to water. Limited opportunities for forage around the pond due to shading by conifer forest, although some is present in association with the springhead, as well as nearby openings created during past timber harvest activities. Channel condition below the pond and lack of riparian vegetation such as willow suggests that

connectivity to Middle Creek is rare and restricted to short times during years of exceptional spring run-off conditions. Streamflow should be considered ephemeral, not intermittent as mapped.

Because the Edie's Pond concentrated use area does not connect regularly to fish habitat, it is not considered to be an aquatic emphasis area.

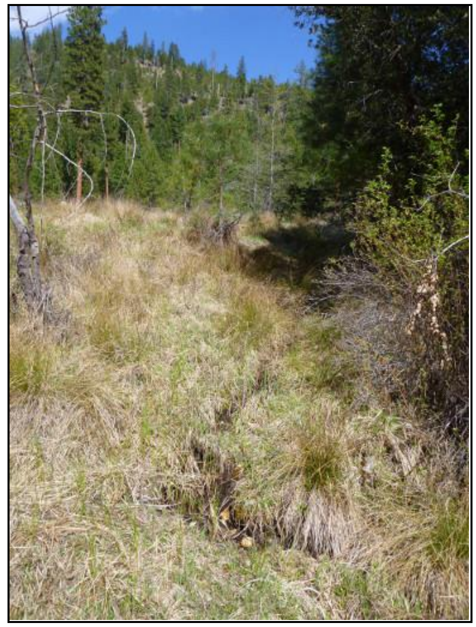

Edie's Pond (April 2014)


Channel below Edie's Pond (May 2014)

Townsend Meadow
Located at the headwaters of an unnamed tributary to Tompkins Creek on the ridgeline between Tompkins Creek and Townsend Gulch. Consists of a single opening in conifer forest. Natural extent of meadow area unknown as has likely been affected in the past due to activities related to timber harvest. Meadow is moist to dry in character with few willows or other riparian brush species. A small wet channel drains the southwest lobe of the meadow, but is very short in length before it goes subsurface and is not associated with any hillside drainage feature. The <u>mapped</u> drainage feature in the west lobe does not connect to the meadow, and is ephemeral in character, not intermittent. This feature lacks indications of annual scour, has upland species of brush and trees growing in it, and has been utilized in part as both skid trail and access road during past timber harvest.

Because the Townsend Meadow concentrated use area does not connect to fish habitat, it is not considered to be an aquatic emphasis area.


Overview of Townsend Meadow (April 2014)


Entirety of seep from Townsend Meadow – no associated hillside drainage feature (April 2014)

Appendix C. Table of Population and Habitat Indicators

Klamath National Forest Matrix: Table of Population and Habitat Indicators for Use on the Klamath National Forest in the Northwest Forest Plan Area

Aquatic Habitat Conditions Analysis Guidelines

AP = Analytical Process for Developing Biological Assessments for Federal Actions Affecting Fish within the Northwest Forest Plan Area (USDI, USDA, and NOAA 2004).
Available at www.blm.gov/or/esa/reports/**Analytical_Process**_110504.doc.

The table(s) within this Appendix show criteria used to determine baseline conditions in 7th-and 5th-field watersheds within the KNF boundaries **that contain anadromous fish habitat**. The criteria in the Table and footnotes are used to describe the current condition of Klamath Mountains watersheds, and to determine if projects are likely to affect anadromous salmonids via effects on salmonid habitat components. Current conditions of watershed(s) are assessed and documented in the Table of Habitat Indicators; and effects to Indicators from proposed actions are discussed in the narrative within the BA/BE and summarized in the Table of Habitat Indicators.

The initial KNF-NMFS Level 1 review of the Table criteria was completed by Perrochet, Thomas, and Flickinger in April 2007. Edits to LWD were made in March 2009 to reflect LRMP EIS values. The Table was updated in 2004 as part of the Analytical Process for ESA consultation with NMFS. In May 2012 Grunbaum and Meneks provided updates/edits to this document and the Table of Habitat Indicators.

The Table, as designed in the 2004 Analytical Process, and in earlier versions (1997 NMFS BO for the LRMP), suggests values to determine a level of functioning for anadromous fish bearing streams. A note about rigid values to assess level of functioning: in addition to fixed habitat parameters not allowing for natural variability, fixed habitat parameters set standards that may be geomorphically inappropriate (Bisson et al. 1997). Variability is an inherent property of aquatic ecosystems in the Pacific Northwest and habitats at any given location will change from year to year, decade to decade, and century to century (Bisson et al. 1997). Healthy lotic ecosystems require different parts of the channel system to exhibit very different in-channel conditions and that those conditions change through time (Reid and Furniss 1998). Also, data may not be available for the stream being assessed. Therefore, a conclusion of function must be evaluated with professional judgment recognizing the streams capability to perform within rigid values. In some cases, a stream's morphology, aspect or size may not support "Properly Functioning" criteria values for one or more habitat Indicators. If an Indicator for a particular stream is determined to be functioning at its capability (due to morphology, aspect, or size), it is rated as Properly Functioning even if it doesn't meet Table criteria values. In the absence of available data, table and associated footnotes suggest factors that should be considered when evaluating indicators.

Klamath National Forest Tributaries Table of Pathways and Indicators

Klamath National Forest Tributaries Table of Pathways and Indicators:

Pathways	***Indicators***	***Properly Functioning***	***At Risk***	***Not Properly Functioning***
Habitat: Non Watershed Condition <u>Indicators</u>				
Water Quality:	Temperature [1]			
	1st - 3rd Order Streams [instantaneous]	69 F degrees (~ 20.5 C) or less	> 69 to 70.5 degrees F	70.5 F degrees (~ 21.3 C) or more
	4th-5th Order Streams [Maximum Weekly Maximum Temperature]	70.5 F degrees (~ 21.4 C) or less	> 70.5 to 73.5 degrees F	73.5 F degrees (~ 23.0 C) or more
	Suspended Sediment/Turbidity	Little to no quantitative turbidity data exists for streams on the Klamath National Forest. Use the following criteria to infer condition of turbidity Indicator: (1) professional judgment from years of direct observation of tributary streams; (2) amount of fines in substrate from stream survey data, (3) CWE modeled level of watershed surface erosion and mass wasting, and (4) condition of stream buffer RR and channel (particularly if there has been recent debris flows that altered the channel). Professional judgment of turbidity is based on observations of water clarity after peak flows in tributaries to the mainstems of the Klamath, Scott, and Salmon Rivers that have watersheds with varying degrees of disturbance from nearly pristine to highly disturbed. Properly Functioning: Water clarity returns quickly (within three days) following peak flows.	Water clarity slow (four to six days) to return following peak flows, moderate to high fines in substrate, moderate modeled surface erosion and mass wasting, and riparian reserves are not fully functioning.	Water clarity poor for long periods of time (one week or more) following peak flows. Some suspended sediments occur even at low flows or base flow. High fines in substrate, stream buffers in poor condition, high modeled surface erosion and mass wasting, and riparian reserves are in poor condition.
	Chemical/Nutrient Contamination [2]	<u>Scott, Salmon, and Klamath River mainstems:</u> Low levels of contamination from agriculture, industrial, and other sources; no excess nutrients. No CWA 303d designated reaches. <u>Scott, Salmon, and Klamath River tributaries</u>: None or low levels of chemical and/or nutrient contamination from agriculture, industrial, and other sources; no excess nutrients.	<u>Scott, Salmon, and Klamath River mainstems:</u> Moderate levels of contamination from agriculture, industrial, and other sources; some excess nutrients. One or more CWA 303d designated reaches <u>Scott, Salmon, and Klamath River tributaries</u>: Moderate levels of contamination from agriculture, industrial, and other sources and/or moderate excess nutrients.	<u>Scott, Salmon, and Klamath Rivers: mainstems:</u> High levels of contamination from agriculture, industrial, and other sources; high levels of nutrients. One or more CWA 303d designated reaches <u>Scott, Salmon, and Klamath River tributaries:</u> High levels of contamination from agriculture, industrial, and other sources and/or moderate to high excess nutrients.
Habitat Access:	Physical Barriers (AP)	Any man-made barriers present in watershed allow upstream and downstream passage at all flows.	One or more human -made barriers present in watershed do not allow upstream and/or downstream passage at base/low flows.	Human-made barriers present in watershed do not allow upstream and/or downstream passage at a range of flows for at least one life history stage.
	Substrate character [3]	Use stream survey data for determining substrate character. In addition, use USLE and GEO models to determine functioning level of Indicator and potential effects of sediment delivery to streams that may affect anadromous fish and their habitat. Can also infer substrate character functioning level from other factors such as high road density and hydrologic connection, recent large intense wildfires, and recent (last 20 years) altered channel.		

Klamath National Forest Tributaries Table of Pathways and Indicators:				
Pathways	***Indicators***	***Properly Functioning***	***At Risk***	***Not Properly Functioning***
Habitat Elements:		Less than 15% fines (<2 mm) in spawning habitat (pool tail-outs, low gradient riffles, and glides) and cobble embeddedness less than 20%. Additional desired conditions, as per TMDL/NCRWB water quality compliance, include: *Pool sediment vol (V*): ≤21% *Subsurface, <0.85 mm: ≤14% *Subsurface, <6.4 mm: ≤30%	15% or greater fines (<2 mm) in spawning habitat (pool tail-outs, low gradient riffles, and glides) and/or cobble embeddedness is 20% or greater.	Greater than 20% fines (<2 mm) in spawning habitat (pool tail-outs, low gradient riffles, and glides) and cobble embeddedness greater than 25%.
	Large Woody Debris (4)	See KNF LRMP EIS Chapter 3, text and tables on Pages 68-69. For stream reaches on the Westside of the Forest, manage for an average of 20 pieces of large wood per 1,000 ft in 3-5th order streams (LRMP Page 4-143). Large wood is defined as a minimum length of 50 feet and diameter of 24 inches on the Westside. However, site potential and channel width must be considered rather than using strict numbers. Also consider the potential for future LWD recruitment in both the short- and long-term.	Current levels are being maintained at minimum levels desired for "properly functioning" but potential sources for long term woody debris recruitment are lacking to maintain these minimum values.	Current levels are not at those desired levels for "properly functioning" and potential sources of woody debris for short and/or long term recruitment are lacking.
	Pool Quality and Frequency (5)	At least one primary pool every three to seven bankfull channel widths. In 1st through 3rd order streams, a primary pool must have a maximum depth of two feet or greater. In 4th and 5th order streams, a primary pool must have a maximum depth of three feet or greater. In 6th order and larger streams, a primary pool must have a maximum depth of four feet or greater.	At least one pool every three to seven bankfull channel widths. At least half of the pools are primary pools. At least half the pools have a maximum depth of at least 24 inches (1st- 3rd order streams) or 36 inches (4th order and greater).	There is less than one pool every three to seven bankfull channel widths and/or less than half the pools have maximum depth of at least 24 inches (1st-3rd order streams) or 36 inches (4th order and greater).
	Off-Channel Habitat	Fish have unrestricted access to off-channel habitats (such as oxbows, off-channel ponds, backwaters, and areas of low flow velocity and cover) in unconstrained reaches during high flows and flooding events in winter. And these off-channel areas are relatively undisturbed by dikes, levees, dredge tailings, roads, excavations, fills, flow diversions, development, vegetation clearing, wood removal, poor water quality, etc.	Fish access to off-channel habitats, and the quantity and quality of off-channel habitats, in unconstrained reaches, is diminished due to dikes, levees, dredge tailings, roads, excavations, fills, flow diversions, development, vegetation clearing, wood removal, poor water quality, etc.	Fish access to off-channel habitats in unconstrained reaches is severely restricted or impossible due to dikes, levees, dredge tailings, roads, excavations, fills, flow diversions, development, etc., and/or the quality of the off-channel habitats is poor due to vegetation clearing, wood removal, poor water quality, and the other factors listed above..

Klamath National Forest Tributaries Table of Pathways and Indicators:				
Pathways	***Indicators***	***Properly Functioning***	***At Risk***	***Not Properly Functioning***
Habitat Elements:	Refugia (important remnant habitat for sensitive aquatic species)	Critical habitats necessary for successful completion of all anadromous salmonid life history phases (spawning, incubation, emergence, freshwater rearing, and migration) are functioning, accessible, and well-distributed. Critical summer refugia in Klamath Mountain streams include: (1) thermal refugia and (2) anadromous stream reaches with intact riparian reserves, cool clean water, pools that are not filled-in or partially filled-in with excess sediment, adequate stream flows, and good water quality. Critical winter habitat for anadromous salmonids includes side channels, off-channel habitats, and floodplain habitats.	Not all critical habitats necessary for successful completion of all anadromous salmonid life history phases are functioning and/or accessible for salmonids and/or well-distributed. Habitat quality and/or accessibility is diminished due to dikes, levees, dredge tailings, other fills, roads, excavations, flow diversions, development, vegetation clearing, wood removal, poor water quality, etc.	Many of the critical habitats necessary for successful completion of all anadromous salmonid life history phases are not functioning and/or not accessible for salmonids, and are thus are poorly distributed across the stream network and not providing adequate biological connectivity.
Channel Condition and Dynamics:	Width/Depth Ratio (6)	Width-to-Depth ratio < 12 on all reaches that could otherwise best be described as 'A', 'G', and 'E' channel types. Width-to-Depth ratio > 12 on all reaches that could otherwise best be described as 'B', 'F', and 'C' channel types. No braided streams formed due to excessive sediment loads. Lacking data, width-to-depth ratio should be evaluated considering the following factors: (1) recent (last 20 years) history of debris flows that have scoured channel and resulted in aggradation or degradation of the stream bed, (2) recent history of mass wasting that delivered large volumes of sediment to the stream that may have filled in pools, (3) pool frequency and depth information from stream surveys, (4) watershed disturbance as estimated with CWE modeling for mass wasting (GEO) and peak flows (ERA/TOC), and (5) frequency of large woody debris in the stream channel. For properly functioning, stream crossing density is low, there have been few mass wasting events caused by management actions, there are numerous deep pools, modeled mass wasting and surface erosion is low, and there is adequate LWD. If there is no or little management disturbance legacy in a watershed, then width-to-depth ratio is assumed to be properly functioning.	More than 10% of the reaches are outside of the ranges given for Width/Depth ratios for the channel types specified in "Properly Functioning" block. Braiding has occurred in some alluvial reaches as a result of excessive aggradation due to high sediment loads. For at-risk, stream crossing density is moderate to high, there have been some mass wasting events caused by management actions, pool frequency and quality is at-risk, modeled mass wasting and surface erosion is moderate to high, and there is inadequate LWD.	More than 25% of the reaches are outside of the ranges given for Width/Depth ratios for the channel types specified in "Properly Functioning" block. Braiding has occurred in many alluvial reaches as a result of excessive aggradation due to high sediment loads. For not properly functioning, stream crossing density is high, there have been some large mass wasting events caused by management actions, pool frequency and quality is poor, modeled mass wasting and surface erosion is moderate to high, and there is inadequate LWD.

Klamath National Forest Tributaries Table of Pathways and Indicators:				
Pathways	***Indicators***	***Properly Functioning***	***At Risk***	***Not Properly Functioning***
	Streambank Condition (AP)	> 80% of any stream reach has ≥ 90% stability. Most watersheds have no bank stability surveys data so the level of streambank stability should be evaluated by considering: (1) density of road-stream crossings per stream or stream reach, (2) amount of inner gorge road, (3) other clearing and/or compaction directly adjacent to the stream, (4) artificial banks created by pushing up berms, and (5) recent (since 1996) channel altering debris flows. For properly functioning: Stream crossing density is low to moderate, there is little to no inner gorge road, there is no or only minor disturbance next to the stream channel, there are few or no berms, dikes, or levees constraining the channel, and/or there has been no or minor channel alteration/filling due to debris flows/landslides related to past management actions.	50-80% of any stream reach has ≥ 90% stability. For at-risk: Stream crossing density is moderate to high, there is some inner gorge road, there is some disturbance next to the stream channel, there are some berms, dikes, or levees constraining the channel, and/or there has been some channel alteration/filling due to debris flows/landslides related to past management actions.	< 50% of any stream reach has ≥90% stability For not properly functioning: Stream crossing density is high, there is over a mile of inner gorge road, there is significant disturbance next to the stream channel, berms, dikes, or levees constrain over a mile of channel; and/or there has been significant channel alteration/filling due to debris flows/landslides related to past management actions.
	Floodplain Connectivity (AP)	Off-channel areas are frequently hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation, and succession.	Reduced linkage of wetland, floodplains, and riparian areas to main channel; overbank flows are reduced relative to historic frequency, as evidenced by moderate degradation of wetland function, riparian vegetation/succession.	Severe reduction in hydrologic connectivity between off-channel, wetland, floodplain, and riparian areas; wetland area drastically reduced and riparian vegetation/succession altered significantly.
Flow / Hydrology:	Change in Peak/Base Flows [7]	Properly functioning watersheds for peak flow have low modeled ERA/TOC, low road density, few large clearings in the rain-snow transition zone, and vegetation close to reference condition. Properly functioning watersheds for base flow have low modeled ERA/TOC, low road density and hydrologic connectivity, and vegetation close to reference condition.	Watersheds at-risk for change in peak flow have moderately high to high modeled ERA/TOC, moderate to high road density, and/or some large recent clearings in the rain-snow transition zone. Watersheds at-risk for change in base flow have denser vegetation compared to reference conditions, several water diversions, and moderate density of roads that have hydrologic connectivity.	Watersheds not properly functioning or change in peak flow have high modeled ERA/TOC, high road density, and may have large recent clearings in the rain-snow transition zone. Watersheds not properly functioning for change in base flow have much denser vegetation compared to reference conditions, numerous or large water diversions, and high density of roads that have hydrologic connectivity.
	Increase in Drainage Network (AP)	Zero or minimum increases in active channel length correlated with human caused disturbance (e.g., trails, ditches, compaction, impervious surface, etc.). The primary cause of drainage network increase in Klamath Mountain watersheds is hydrologic connectivity between the road system and the stream network.	Low to Moderate increases in active channel length correlated with human caused disturbance (e.g., trails ditches, compaction, impervious surface, etc.).	Greater than moderate increase in active channel length correlated with human caused disturbance (e.g., trails ditches, compaction, impervious surface, etc.).

Klamath National Forest Tributaries Table of Pathways and Indicators:				
Pathways	***Indicators***	***Properly Functioning***	***At Risk***	***Not Properly Functioning***
Watershed Condition <u>Indicators</u>				
Watershed Conditions:	Road Density and Location (AP)	Less than 2 miles per square mile.	Two to three miles per square mile.	Over 3 miles per square mile.
	Riparian Reserves – NW Forest Plan (AP) [(8)]	The riparian reserve system provides adequate shade, large woody debris recruitment, and habitat protection and connectivity in all subwatersheds, and buffers or includes known refugia for sensitive aquatic species (> 80% intact), and/or for grazing impacts; percent similarity of riparian vegetation to the potential natural community/composition > 50%.	Moderate loss of connectivity or function (shade, LWD recruitment, etc.) of riparian reserve system, or incomplete protection of habitat and refugia for sensitive aquatic species (approx. 70-80% intact), and/or for grazing impacts; percent similarity of riparian vegetation to the potential natural community/composition 25-50% or better. Some past stand-replacement timber harvest or intense fire in RR, moderate road and landing density in RR, minor to moderate level of mining in RR, vegetation/fuels moderately departed from historic fuels conditions, species diversity and vegetation structure in stream buffers moderately altered from reference condition due to fire suppression and past timber harvest, and moderate modeled CWE values.	Riparian reserve system is fragmented, poorly connected, or provides inadequate protection of habitat and refugia for sensitive aquatic species (approx. less than 70% intact), and/or for grazing impacts; percent similarity of riparian vegetation to the potential natural community/composition is 25% or less. Extensive past stand-replacement timber harvest or intense fire in RR, high road and landing density in RR, moderate to high intensity of mining in RR, vegetation/fuels greatly departed from historic fuels conditions, species diversity and vegetation structure in stream buffers significantly altered from reference condition due to fire suppression and past timber harvest, and high modeled CWE values.
	Disturbance History/Regime	Frequency, duration, and magnitude of stochastic disturbance events are close to reference condition. The following factors should be considered in rating the Watershed Disturbance/Regime indicators: (1) overall watershed disturbance as determined through CWE modeling, (2) road density and location, (3) current impacts from past stand-replacing forestry, mining, and intense fires, (4) departure from historic fire regime, (5) departure from historic vegetation structure and composition, and (6) character of development on private property. For properly functioning, a watershed should have low CWE and road density (all models under "1" threshold), few impacts from past stand-replacement forestry or intense fire, are not significantly departed from historic vegetation/fuels condition and fire regime, and/or have low disturbance on private property.	In at-risk watersheds, frequency, duration, and magnitude of stochastic disturbance events are moderately departed from reference condition. At-risk watersheds have moderate to high CWE and road density (one or two models over "1" threshold), some significant impacts from past stand-replacement forestry or intense fire, are moderately departed from historic vegetation/fuels condition and fire regime, and/or have moderate disturbance on private property.	In not properly functioning watersheds, frequency, duration, and magnitude of stochastic disturbance event is significantly departed from reference condition. Not properly functioning watersheds have high CWE and road density (all models over "1" threshold), significant impacts from past stand-replacement forestry or intense fire, are significantly departed from historic vegetation/fuels condition and fire regime, and/or have significant disturbance on private properties.
Summary Integration of all species and habitat indicators effects	How do the effects to indicators affect each fish species and their habitat? Describe by species and by 7th and 5th field watersheds. See AP guidance. In addition to the narrative summary, use Summary Table in Tables required for BA/BE.			

Footnotes to Table Above: *Table of Population and Habitat Indicators For Use on the Klamath National Forest in the Northwest Forest Plan Area, as adjusted from Appendix A in the Analytical Process.*

1) (Temperature) Proper Functioning criteria for 4^{th} -5th Order streams is derived from temperature monitoring near the mouth of streams of relatively undisturbed watersheds (Clear, Dillon, and Wooley Creeks). –Maximum Weekly Maximum Temperatures (MWMT) as high as 70.5 degrees F have been recorded on these streams (EA Engineering, 1998 Salmon River and Dillon Creek Watershed Fish Habitat and Channel Type Analysis, Appendix 2). At-Risk criteria for 4th/5th order streams is derived from monitoring in streams that support populations of anadromous fish, although temperatures in this range (70.5 to 73.5 degrees F) are considered sub-optimal. The Not Properly Functioning criterion is sustained temperatures above 73.5 degrees F - that causes cessation of growth and approach lethal temperatures for salmon and steelhead. Properly Functioning criteria for 1st - 3rd order streams is derived from Desired Future Conditions (DFC) values given in the LRMP EIS p 3-68. At Risk and Not Properly Functioning criteria for 1^{st} – 3^{rd} order streams are assigned on a temperature continuum with values given for 4th/5th order streams, with the maximum instantaneous temperature of At Risk 1st - 3rd order streams coinciding with the minimum MWMT of 4th/5th order At Risk streams. [Stream Order according to Strahler (1957).]

(2) (Chemical/Nutrient Contamination) For projects within the river corridors of the mainstem Scott, Salmon, and Klamath Rivers the criteria is unchanged from AP Table. For tributaries to the Scott, Salmon, and Klamath Rivers use the criteria from the AP table. Although these tributaries have CWA 303d designation, Klamath National Forest tributaries are typically properly functioning for dissolved oxygen, nutrients, and microcystin, and because temperature and sediment is assessed in the Temperature and Substrate Character Indicators. Chemical contamination and nutrients should be assessed for Scott, Salmon, and Klamath River tributaries.

(3) (Substrate Character) Use recent stream survey data where available. Properly Functioning criteria for % fines in gravel is from the LRMP EIS p 3-68. Additional Forest-wide desired conditions for sediment (pool sediment, subsurface sediment) are described by Laurie and Elder (2012) in relation to monitoring for TMDL and NCRWB water quality standards. When location-specific information is unavailable, use the following as best appropriate: use USLE and GEO models to determine functioning level of Indicator and potential effects of sediment delivery to streams that may affect anadromous fish and their habitat, infer substrate character functioning level from other factors such as high road density and degree of hydrologic connection, recent large intense wildfires, and recent (last 20 years) debris flows that altered channels, and lastly use professional judgment to describe existing conditions and to estimate effects based upon model output interpretation, research results, or other information. The KNF CWE modeling procedure describes the risk (probability) of project-caused sediment production (see 2004 CWE process paper, by Elder and Reichert, in fisheries sufficiency guides). For existing condition and effects of the action:

1. Properly Functioning: USLE and GEO values are less than 1.0
2. At Risk: USLE and GEO values are between 1.0-1.20
3. Not Properly Functioning: USLE and GEO values are greater than 1.20

(4) (Large Woody Debris) See KNF LRMP EIS Chapter 3, text and tables on Pages 68-69. For stream reaches on the Westside of the Forest, manage for an average of 20 pieces of large wood per 1,000 ft in 3-5th order streams (LRMP Page 4-143). Large wood is defined as a minimum length of 50 feet and diameter of 24 inches on the Westside. However, site potential and channel width must be considered rather than using strict numbers. Also consider the potential for future LWD recruitment in both the short- and long-term.

Criteria for length of LWD for larger streams may be based on average bankfull channel width of the reach: in streams larger than 3rd order a piece of woody debris may qualify as large woody debris in a stream reach if its length is 1.5 times the average bankfull channel width, or if it has a rootwad attached and its length is 1¼ times the average bankfull channel width. Stable pieces of woody debris remain stationary during normal to high flows. Channel width and depth largely determines whether large woody debris recruited into a stream reach will be stable, and largely determines the average size of wood retained in streams (Bilby and Ward 1989, 1991; Robison and Beschta 1990). As channels become wider and deeper, the average size of a stable piece of wood increases. Pieces shorter than bankfull width and with a diameter less than bankfull depth are more likely to be transported out of a reach by streamflow (Bilby 1984, Braudrick et al. 1997). Length of woody debris appears to be most important to its stability where stream discharge is sufficient to float large diameter stems (Bilby 1985, Swanson and others 1984). Branches and/or rootwads, if still attached, add to the stability of woody debris. Therefore, criteria for length of LWD for larger streams may be based on average bankfull channel width of the reach: in streams larger than 3rd order a piece of woody debris may qualify as large woody debris in a stream reach if its length is 1.5 times the average bankfull channel width, or if it has a rootwad attached and its length is 1¼ times the average bankfull channel width.

(5) (Pool Quality and Frequency) A measurable pool is an area of channel which (1) shows clear signs that the pool was created by scour at high flows and/or that the pool is the result of the channel being dammed at the downstream end; (2) has a significant residual depth - the deepest part of the pool must be at least twice as deep as the water flowing out of the pool at the riffle crest; (3) has an essentially flat water surface during low flow - water surface slope <0.05 percent; and (4) includes most of the channel - it must include the thalweg and occupy at least half of the width of the low-flow channel. "Primary" pools are defined by their maximum depth in relationship to size or stream order. As the order or size of the stream increases the required minimum depth for a primary pool increases. In 1st through 3rd order streams, a primary pool must have a minimum depth of two feet or greater. In 4th and 5th order streams, a primary pool must have a minimum depth of three feet. In 6th order and larger streams, a primary pool must have a minimum depth of four feet.

(6) (Width/Depth Ratio) The Width-to-Depth ratio for various channel types is based on delineative criteria of Rosgen (1996). Properly Functioning means that Width-to-Depth ratio falls within expected channel type as determined by the other four delineative factors (entrenchment, sinuosity, slope, and substrate). Aggradation on alluvial flats causing braiding is well known phenomenon that often accompanies changes in Width-to-Depth ratio as watershed condition deteriorates. Stream width is a function of streamflow occurrence and magnitude, size and type of transported sediment, and the bed and bank materials of the channel (Rosgen 1996). Channel widths generally increase with flow volume downstream. Channel widths can be modified by changes in riparian vegetation, landslides particularly debris flows, changes in streamflow regimes, and changes in sediment supply. The AP Table indicates that confined or entrenched channel types (such as A, G, and E types) are Properly Functioning when Width-to-Depth ratios are <12, and wider channel types (such as B, C, and F types) are Properly Functioning when Width-to-Depth ratios are >12. To meet the Properly Functioning criteria channels must also have no or minimal braiding due to excessive sediment.

(7) (Peak/Base Flows) In most cases, sufficient hydrograph data is not available to determine comparative changes in peak flows as suggested in the AP. Infer changes in **peak flows** when no hydrograph data is available by considering the following factors: (1) CWE runoff model (ERA/TOC) outputs, (2) road density and the degree of hydrologic connectivity between the road system and the stream network, and (3) number, size, and vintage of openings in the forest canopy resulting from past stand-replacement forestry in the snow-rain transition zone where increased openings can result in elevated runoff from rain-on-snow events. The potential for decreased **base flows** in the Project HUC7 watersheds should be evaluated by considering the following factors: (1) increased/decreased evapotranspiration due to denser/sparser vegetation than reference condition that has resulted from stand-replacement forestry and/or fire suppression, (2) number and size of water diversions, and (3) degree of hydrologic connectivity between the road system and the stream network (watersheds with high road density likely have reduced base flows due to impervious surfaces and groundwater interception in road cuts).

(8) (Riparian Reserves) The following factors should be considered in determining the condition of stream buffer (hydrologic) RR: (1) amount and age of past stand-replacement forestry or intense fire in stream buffers, (2) road and landing density in stream buffers, (3) mining in stream buffers, (4) departure from historic fire regime, (5) condition of riparian vegetation for providing shade, large woody debris, sediment-filtering, and nutrient cycling, and (6) the amount of overall disturbance in the watershed particularly as estimated by the peak flow (ERA) and mass wasting (GEO) models. The following two factors should be considered in determining the condition of geologic RR: (1) amount and age of past stand-replacement timber harvest and/or recent intense wildfire on geologic RR and (2) road and landing density on geologic RR.

Appendix D. Environmental Baseline and Proposed Action Effects Checklist

Checklists for documenting environmental baseline and effects of proposed actions(s) on relevant indicators for

LAKE MOUNTAIN AND MIDDLE TOMPKINS ALLOTMENT MANAGEMENT PLAN PROJECT

Legend For Reference Information Used to Determine Baseline Conditions:

ND: No data
N/A: Not applicable
PJ: Professional judgment (M. Meneks – District Fish Biologist)
CDFW 2014: Passage assessment database query
CDOT 2013: California Department of California annual fish passage progress report (CDOT 2013)
Sed 2013: Sediment monitoring, KNF – 2009 to 2013 (USFS 2013a)
WQ 2012: Stream temperature monitoring, KNF – 2010 and 2011 (Laurie 2012)
HRC: Historic reference condition mapping for Thom-Seider Project (Creasy, *et al.* 2007)
Flood 1997: 1997 Klamath National Forest flood assessment (de la Fuente and Elder 1997)
WA 2000: Lower Scott Ecosystem Analysis (USFS 2000)
WA 1999: Thompson/Seiad/Grider Ecosystem Analysis (USFS 1999)

CDFW 2014: 2013 Scott River studies final report (Knechtle and Chesney 2014)
CDFW 201l: Outmigrant screw trap data for Scott River, 2010 (Daniels, *et al.* 2011)

CWE: CWE data by watershed (see Table 10 in document text)

Temps: Summer temperature data (2010 – 2013) – O'Neil Creek, Grider Creek, Tompkins Creek, Scott River

O'Neil 2007: O'Neil Creek survey data – 2007 (unpub. data)
USFS 2013: Tompkins Creek pool analysis (USFS 2013b)

CA-EPA: http://www.swrcb.ca.gov/northcoast/water_issues/programs/tmdls/303d/

Table of Pathway and Indicators for 7th Field Watershed: Tompkins Creek

DIAGNOSTIC OR PATHWAY and INDICATOR	Environmental Baseline			Effects of the Action		
	PROPERLY FUNCTIONING	FUNCTIONING - AT RISK	NOT PROP. FUNCT.	RESTORE	MAINTAIN	DEGRADE
HABITAT:						
Habitat Quality Temperature[1]	WQ 2012; Temps				X	
Suspended Sediment - Intergravel DO/Turbidity[1]		Sed 2013; WA 2000; CWE; PJ			X	
Chemical Contamination/ Nutrients	PJ				X	
Habitat Access Physical Barriers	CDFW 2014; PJ				X	
Habitat Elements Substrate Character and Embeddedness[2]		Sed 2013; CWE; PJ			X	
Large Woody Debris[2]			WA 2000; PJ		X	
Pool Frequency and Quality		USFS 2013; PJ			X	
Large Pools						
Off-channel Habitat	PJ				X	
Refugia	PJ				X	
Channel Cond & Dyn Average Wetted Width/Maximum Depth	WA 2000				X	
Streambank Condition		PJ			X	
Floodplain Connectivity	PJ				X	
Flow/Hydrology Change in Peak/Base Flows[1]		PJ			X	
Increase in Drainage Network		PJ			X	
Watershed Conditions Road Density & Location		Sed 2013; WA 2000			X	
Disturbance History & Regime[3]		WA 2000; PJ			X	
Riparian Reserves - Northwest Forest Plan[1]		WA 2000; PJ			X	
SPECIES AND HABITAT:						
Species and Habitat: Summary/Integration of all Species and Habitat Indicators		X			X	
	Due to lack of recent data to compare to older, the trend for anadromous fish in this drainage is unknown. See Life History section for additional information			See Env. Conseq. and Table 8 for a Indicator effects summary. The Env. Conseq. section also describes effects to fish and their habitat. Project not cause adverse effects.		

[1]Indicator potentially affected by 2014 Happy Camp Complex fire. Baseline not expected to change (PJ).
[2]Indicator potentially affected by fire. Baseline may change, but will require one or more years of monitoring and/or observation to determine if necessary to alter baseline.
[3]Indicator affected by fire. Baseline may or may not have been altered compared to pre-fire.

Table of Pathway and Indicators for 7th Field Watershed:
O'Neil Creek

DIAGNOSTIC OR PATHWAY and INDICATOR	Environmental Baseline			Effects of the Action		
	PROPERLY FUNCTIONING	FUNCTIONING - AT RISK	NOT PROP. FUNCT.	RESTORE	MAINTAIN	DEGRADE
HABITAT:						
Habitat Quality Temperature[1]	Temps				X	
Suspended Sediment - Intergravel DO/Turbidity[2]		O'Neil 2007; CWE			X	
Chemical Contamination/ Nutrients	EPA-CA				X	
Habitat Access Physical Barriers		CDFW 2014; CDOT 2013			X	
Habitat Elements Substrate Character and Embeddedness[2]		O'Neil 2007; CWE			X	
Large Woody Debris[2]		O'Neil 2007			X	
Pool Frequency and Quality		O'Neil 2007			X	
Large Pools						
Off-channel Habitat	N/A - Not present					
Refugia		PJ			X	
Channel Cond & Dyn Average Wetted Width/Maximum Depth		O'Neil 2007; Flood 1997			X	
Streambank Condition	O'Neil 2007				X	
Floodplain Connectivity	PJ				X	
Flow/Hydrology Change in Peak/Base Flows[2]		PJ			X	
Increase in Drainage Network		PJ			X	
Watershed Conditions Road Density & Location			WA 1999		X	
Disturbance History & Regime[3]		Flood 1997; HRC; CWE			X	
Riparian Reserves - Northwest Forest Plan[2]	O'Neil 2007; WA 1999				X	
SPECIES AND HABITAT:						
Species and Habitat: Summary/Integration of all Species and Habitat Indicators		X			X	
	Due to lack of data, the trend for anadromous fish in this drainage is unknown. See Life History section for additional information			See Env. Conseq. and Table 8 for a Indicator effects summary. The Env. Conseq. section also describes effects to fish and their habitat. Project not cause adverse effects.		

[1]Indicator potentially affected by 2014 Happy Camp Complex fire. Baseline not expected to change (PJ).
[2]Indicator potentially affected by fire. Baseline may change, but will require one or more years of monitoring and/or observation to determine if necessary to alter baseline.
[3]Indicator altered to reflect post-fire status. Baseline may or may not have been altered compared to pre-fire.

Table of Pathway and Indicators for 7th Field Watershed:
Macks Creek

DIAGNOSTIC OR PATHWAY and INDICATOR	Environmental Baseline			Effects of the Action		
	PROPERLY FUNCTIONING	FUNCTIONING - AT RISK	NOT PROP. FUNCT.	RESTORE	MAINTAIN	DEGRADE
HABITAT:						
Habitat Quality Temperature	No data available				X	
Suspended Sediment - Intergravel DO/Turbidity[2]	CWE				X	
Chemical Contamination/ Nutrients	EPA-CA				X	
Habitat Access Physical Barriers			CDFW 2014; PJ		X	
Habitat Elements Substrate Character and Embeddedness	No data available				X	
Large Woody Debris[2]	N/A for streams less than 3rd order, but is probably not properly functioning (WA 1999)				X	
Pool Frequency and Quality	No data available				X	
Large Pools						
Off-channel Habitat	N/A - Not present					
Refugia			PJ (barrier)		X	
Channel Cond & Dyn Average Wetted Width/Maximum Depth	No data available				X	
Streambank Condition	No data available				X	
Floodplain Connectivity	No data available				X	
Flow/Hydrology Change in Peak/Base Flows[2]	CWE; PJ				X	
Increase in Drainage Network	PJ				X	
Watershed Conditions Road Density & Location	WA 1999				X	
Disturbance History & Regime[3]	CWE; WA 1999				X	
Riparian Reserves - Northwest Forest Plan	No data available				X	
SPECIES AND HABITAT:						
Species and Habitat: Summary/Integration of all Species and Habitat Indicators		X			X	
	Due to lack of data, the trend for anadromous fish in this drainage is unknown. If anadromous fish are present in the creek, they would not be able to access Forest Service land due to highway culvert. See Life History section for additional information			See Env. Conseq. and Table 8 for a Indicator effects summary. The Env. Conseq. section also describes effects to fish and their habitat. Project not cause adverse effects.		

[1]Indicator potentially affected by 2014 Happy Camp Complex fire. Baseline not expected to change (PJ).
[2]Indicator potentially affected by fire. Baseline may change, but will require one or more years of monitoring and/or observation to determine if necessary to alter baseline.
[3]Indicator altered to reflect post-fire status. Baseline may or may not have been altered compared to pre-fire.

Table of Pathway and Indicators for 7th Field Watershed: Rancheria Creek

DIAGNOSTIC OR PATHWAY and INDICATOR	Environmental Baseline			Effects of the Action		
	PROPERLY FUNCTIONING	FUNCTIONING - AT RISK	NOT PROP. FUNCT.	RESTORE	MAINTAIN	DEGRADE
HABITAT:						
Habitat Quality Temperature	No data available				X	
Suspended Sediment - Intergravel DO/Turbidity[2]	CWE				X	
Chemical Contamination/ Nutrients	PJ				X	
Habitat Access Physical Barriers	CDFW 2014; PJ				X	
Habitat Elements Substrate Character and Embeddedness	No data available				X	
Large Woody Debris[2]	N/A for streams less than 3rd order, but is probably not properly functioning (WA 1999)				X	
Pool Frequency and Quality	No data available				X	
Large Pools						
Off-channel Habitat	N/A - Not present					
Refugia	PJ				X	
Channel Cond & Dyn Average Wetted Width/Maximum Depth	No data available				X	
Streambank Condition	No data available				X	
Floodplain Connectivity	No data available				X	
Flow/Hydrology Change in Peak/Base Flows[2]	CWE; PJ				X	
Increase in Drainage Network	PJ				X	
Watershed Conditions Road Density & Location	WA 1999				X	
Disturbance History & Regime[3]		CWE			X	
Riparian Reserves - Northwest Forest Plan	No data available				X	
SPECIES AND HABITAT:						
Species and Habitat: Summary/Integration of all Species and Habitat Indicators		X			X	
	Due to lack of data, the trend for anadromous fish in this drainage is unknown. See Life History section for additional information			See Env. Conseq. and Table 8 for a Indicator effects summary. The Env. Conseq. section also describes effects to fish and their habitat. Project not cause adverse effects.		

[1]Indicator potentially affected by 2014 Happy Camp Complex fire. Baseline not expected to change (PJ).
[2]Indicator potentially affected by fire. Baseline may change, but will require one or more years of monitoring and/or observation to determine if necessary to alter baseline.
[3]Indicator altered to reflect post-fire status. Baseline may or may not have been altered compared to pre-fire.

Table of Pathway and Indicators for 5th Field Watershed:
Lower Scott River (Scott River)

DIAGNOSTIC OR PATHWAY and INDICATOR	Environmental Baseline: PROPERLY FUNCTIONING	Environmental Baseline: FUNCTIONING - AT RISK	Environmental Baseline: NOT PROP. FUNCT.	Effects of the Action: RESTORE	Effects of the Action: MAINTAIN	Effects of the Action: DEGRADE
HABITAT:						
Habitat Quality Temperature			Temps		X	
Suspended Sediment - Intergravel DO/Turbidity		PJ			X	
Chemical Contamination/ Nutrients			CA-EPA		X	
Habitat Access Physical Barriers	CDFW 2014				X	
Habitat Elements Substrate Character and Embeddedness			PJ[1,2]		X	
Large Woody Debris			WA 2000		X	
Pool Frequency and Quality	No data available - likely altered due to historic mining practices				X	
Large Pools						
Off-channel Habitat		PJ[1]			X	
Refugia		PJ[1]			X	
Channel Cond & Dyn Average Wetted Width/Maximum Depth	No data available - likely altered due to historic mining practices				X	
Streambank Condition			PJ[1,2]		X	
Floodplain Connectivity		PJ[1]			X	
Flow/Hydrology Change in Peak/Base Flows		PJ[1]			X	
Increase in Drainage Network		PJ[1]			X	
Watershed Conditions Road Density & Location		WA 2000			X	
Disturbance History & Regime		WA 2000, PJ[1]			X	
Riparian Reserves - Northwest Forest Plan		WA 2000; PJ			X	
SPECIES AND HABITAT:						
Species and Habitat: Summary/Integration of all Species and Habitat Indicators		X			X	
	Due to lack of data, specific trend for anadromous fish in this drainage is unknown. However, some sources are available to examine the general Scott River condition. (1) Screw trap data since 2000 suggests a steady to upward trend for Chinook smolts and steady to slightly down for steelhead smolts (CDFW 2011). (2) Run size estimate for spawning Chinook since 1978 is steady to slightly down (CDFW 2013). Recent trends for Coho are unclear, but overall the run is considered to be depressed. See Life History section for additional information			See Env. Conseq. and Table 8 for an Indicator effects summary. The Env. Conseq. section also describes effects to fish and their habitat. Project not cause adverse effects.		

[1] This 5th-field watershed includes extensive private property within/without the Forest boundary. Historic resource use throughout the drainage, including dredging, has impacted the watershed, and agriculture and timber extraction continue on private. Therefore, while Forest Service, or inholdings within the boundary, may show properly functioning condition - for instance, all CWE models under "1" threshold (CWE 2012b) - the consideration of the *whole* 5th-field watershed suggest lower ratings. Data is largely lacking for private properties.

[2] Due to size of lower Scott River and extreme difficulty to survey, comprehensive datasets for physical attributes are not available.

Table of Pathway and Indicators for 5^{th} Field Watershed:
Seiad Creek-Klamath River (Grider Creek)

DIAGNOSTIC OR PATHWAY and INDICATOR	Environmental Baseline			Effects of the Action		
	PROPERLY FUNCTIONING	FUNCTIONING - AT RISK	NOT PROP. FUNCT.	RESTORE	MAINTAIN	DEGRADE
HABITAT:						
Habitat Quality Temperature[2]	WQ 2012; Temps				X	
Suspended Sediment - Intergravel DO/Turbidity[2]	Sed 2013; CWE				X	
Chemical Contamination/ Nutrients	EPA-CA				X	
Habitat Access Physical Barriers	CDFW 2014				X	
Habitat Elements Substrate Character and Embeddedness[2]	Sed 2013; CWE; WA 1999				X	
Large Woody Debris[2]			WA 1999		X	
Pool Frequency and Quality			WA 1999		X	
Large Pools						
Off-channel Habitat	N/A - Not present (WA 1999)					
Refugia	WA 1999; PJ				X	
Channel Cond & Dyn Average Wetted Width/Maximum Depth	WA 1999				X	
Streambank Condition	WA 1999				X	
Floodplain Connectivity	PJ				X	
Flow/Hydrology Change in Peak/Base Flows[2]	CWE				X	
Increase in Drainage Network	PJ				X	
Watershed Conditions Road Density & Location	Sed 2013; WA 1999				X	
Disturbance History & Regime[3]	CWE; WA 1999; PJ				X	
Riparian Reserves - Northwest Forest Plan[2]	WA 1999				X	
SPECIES AND HABITAT:						
Species and Habitat: Summary/Integration of all Species and Habitat Indicators		X			X	
	Due to lack of data, the trend for anadromous fish in this drainage is unknown. See Life History section for additional information			See Env. Conseq. and Table 8 for a Indicator effects summary. The Env. Conseq. section also describes effects to fish and their habitat. Project not cause adverse effects.		

[1]Indicator potentially affected by 2014 Happy Camp Complex fire. Baseline not expected to change (PJ).
[2]Indicator potentially affected by fire. Baseline may change, but will require one or more years of monitoring and/or observation to determine if necessary to alter baseline.
[3]Indicator altered to reflect post-fire status. Baseline may or may not have been altered compared to pre-fire.

Table of Pathway and Indicators for 5th Field Watershed:
Seiad Creek-Klamath River (Klamath River)

A pathway and indicators table for Klamath River mainstem is not explicitly included for several reasons. First and foremost, the Klamath River is a very large system. As such, traditional surveys are very difficult to undertake; and, therefore, little specific habitat data exists of the type appropriate to use to fill out the table information. The presence of extensive private property also makes for difficult access. Additionally, the river is impacted by many legacy and on-going activities/facilities – for instance (not an exhaustive list) dredge mining (large- and small-scale), upstream dams, agriculture, State/County roads, timber harvest on private land – which are beyond the scope of control by the Forest Service. It is the professional judgment of the Fish Biologist that most indices for the Klamath River mainstem in the 5th-field watershed area are either at-risk or not-properly-functioning. Overall, the Forest Service's ability to measurably affect conditions of the Klamath River due to proposed Project actions is non-existent.

References:

California Department of Transportation (CDOT). 2013. Coastal anadromous fish passage assessment and remediation progress report - annual report to the legislature for annual year 2012. California Department of Transportation, Division of Environmental Analysis, Sacramento, CA. 12 p.

Creasy, M., Safford, H., and D. Schmidt. 2007. Draft historic reference condition mapping, Thom Seider Project, Klamath National Forest. Prepared by the Klamath National Forest and The Nature Conservancy.

Daniels, S., Debrick, A., Diviney, C., Underwood, K., Stenhouse, S., and W. Chesney. 2011. Final report Shasta and Scott River juvenile salmonid outmigrant study, 2010. Report #P071307. California Department of Fish and Wildlife, Northern Region, Yreka, CA. 97 p.

de la Fuente, J., and D. Elder. 1997. The Flood of 1997 Klamath National Forest, Phase 1 Final Report: November 24, 1998. Klamath National Forest, Yreka, CA. 66 p + appendices.

Knechtle, M., and D. Chesney. 2014. 2013 Scott River salmon studies final report. California Department Fish and Wildlife, Northern Region, Yreka, CA. 23 p.

Laurie, G. 2012. Draft stream temperature monitoring on the Klamath National Forest, 2010 to 2011. Klamath National Forest, Yreka, CA. 17 p.

USDA Forest Service (USFS). 2013a. Stream sediment monitoring on the Klamath National Forest, 2009-2012. Klamath National Forest, Yreka, CA. 18 p.

______. 2013b. Tompkins Creek pool analysis (2013). Salmon-Scott River Ranger District, Klamath National Forest, CA. 4 p.

______. 2000. Lower Scott Ecosystem Analysis. Scott River Ranger District, Klamath National Forest, Etna, CA. 156 p + appendices.

______. 1999. Thompson/Seiad/Grider Ecosystem Analysis. Happy Camp Ranger District, Klamath National Forest, Happy Camp, CA. 127 p + appendices.

Appendix E. Best Management Practices

Best Management Practices (BMPs) were developed to comply with Section 208 of the Clean Water Act. BMPs have been certified by the State Water Quality Resources Control Board and approved by the Environmental Protection Agency (EPA) as the most effective way of protecting water quality from impacts stemming from non-point sources of pollution. These practices have been applied to forest activities and have been found to be effective in protecting water quality within the Klamath National Forest. Specifically, effective application of the Region 5 USFS BMPs has been found to maintain water quality that is in conformance with the Water Quality Objectives in the North Coast Regional Water Quality Control Board's (NCRWQCB's) Basin Plan (http://www.waterboards.ca.gov/northcoast/water_issues/programs/basin_plan/).

Region 5 Forest Service BMPs have been monitored and modified since their original implementation in 1979 to make them more effective. Numerous on-site evaluations by the NCRWQCB have found the practices to be effective in maintaining water quality and protecting beneficial uses.

The Forest monitors the implementation and effectiveness of BMPs on randomly selected projects each year. From 2000 to 2012, BMP implementation requirement were met on 78-100% (91% average) of sites sampled, and BMP effectiveness requirements were met on 88-100% (94% average) of the sites sampled (USFS 2013). The critical BMP evaluation is *effectiveness* which is a field evaluation to determine how well the BMP worked to prevent sedimentation. The success rate for effectiveness has been in the high 80s and 90s each year since 1993. Results of this monitoring can be found on the Klamath National Forest webpage (http://www.fs.usda.gov/detail/klamath/landmanagement/resourcemangement/?cid=stelprdb5312713).

Best Management Practices first identified and utilized by the Klamath National Forest are listed in Appendix D of the LRMP (USFS 1995). These basic BMPs have been revised over the years, and are currently similar to those listed in the 2011 Region 5 BMP update in Chapter 10 of the Soil and Water Conservation Handbook, which additionally includes a narrative and objective of each (USFS 2011); and where there are differences, direction is to employ the newer BMP list.

The most updated list of BMPs utilized in the Project is available in the Environmental Assessment and Project Record. For purposes of consultation, this appendix incorporates the BMP list version as of 05/12/14. This version is not expected to substantially change prior to Project finalization.

BMP 7.8 – Cumulative Off-site Watershed Effects: Protects the identified beneficial uses of water from the combined effects of multiple management activities which individually may not create unacceptable effects, but collectively may result in degraded water-quality conditions.

- The KNF cumulative watershed effects model "Equivalent Roaded Area" adjusted to include grazing within the Project area.

BMP 8.1 – Range Management Planning: Uses the allotment management planning process to develop measures to avoid, minimize, mitigate and/or restore adverse impacts to water and aquatic and riparian resources during rangeland management activities.

- Adoption of Adaptive Management Strategy.
- Establishment of allotment-specific season-of-use, utilization standards, HMs, etc.

- Selection of annual and long-term monitoring protocols appropriate for local landscape conditions and management objectives.
- Setting of trigger points based upon monitoring to implement Adaptive Management Strategy.
- Protection measure for Coho and Critical Habitat: When animals are being actively herded, cattle will not be permitted to water or forage within Tompkins Creek where anadromy has been mapped. Language of this prohibition will be included within the allotment management plan.
- Lookout Spring redevelopment identified as an immediate improvement need. Additional projects listed to be considered for analysis and implementation based upon Adaptive Management Strategy.

BMP 8.2 – Rangeland Permit Administration: Manages rangeland vegetation and grazing to protect water and aquatic and riparian resources through administration and monitoring of grazing permits and annual operating instructions.

- Adoption of Adaptive Management Strategy

BMP 8.3 – Rangeland Improvements: Implements range improvements to protect, maintain or improve water and aquatic and riparian resources and associated beneficial uses.

- Lookout Spring redevelopment identified as an immediate need to improve condition at a known location of chronic overgrazing.
- Multiple potential projects have been identified, but will only be analyzed, as necessary, and implemented if need develops through the Adaptive Management process.

USDA Forest Service (USFS). 2013. Klamath National Forest Best Management Practices - Region 5 evaluation program water quality monitoring report – 2012 Fiscal Year. Klamath National Forest, Yreka, CA. 34 p.

_____. 2011. R5 FSH 2509.22: Soil and water conservation handbook; Chapter 10 – Water quality management handbook. USDA Forest Service, Pacific Southwest Region. 263 p.

_____. 1995. Klamath National Forest Land and Resource Management Plan. Updated 2010 with Chapters 3 and 4 amendments. Klamath National Forest, Yreka, CA.

Appendix F. Life History and Biological Requirements of Pacific Salmonids

Coho Salmon

General life history information and biological requirements of Southern Oregon/Northern California Coastal (SONCC) Coho salmon have been described in various documents (Hassler 1987; Sandercock 1991; Weitkamp, *et al.* 1995) as well as NOAA-Fisheries' final rule listing SONCC Coho salmon (May 6, 1997; 62 FR 24588).

Coho salmon enter the mainstem of the Klamath River for spawning typically in their third year, primarily between September and December, with a peak in October (NFMS 2007). Over most of this interval, mainstem flows below Iron Gate Dam often are high (ca. 2500-3000 cfs: NMFS 2001). Thus, standard methods for observing and counting spawning fish are not easily applied, and the size of the spawning population is unknown. Approximations put the entire ESU at about 10,000 spawning Coho salmon of non-hatchery origin per year (Weitkamp, *et al.* 1995), of which only a small portion is associated with the Klamath Basin, where several important tributary runs have been reduced to a handful of individuals (NMFS 2001, 2007). Although a minor amount of spawning and growth may occur in the mainstem, the mainstem serves adults primarily as a migration route (NFMS 2007).

Spawning occurs from November to January (Hassler 1987) in the tributaries to the Klamath River, but occasionally as late as February or March (Weitkamp, *et al.* 1995). Coho salmon eggs incubate for 35-50 days between November and March. Successful incubation depends on several factors including dissolved oxygen levels, temperature, substrate size, amount of fine sediment, and water velocity. Fry start emerging from the gravel two to three weeks after hatching and move into shallow areas with vegetative or other cover. As fry grow larger, they disperse up or downstream. In summer, Coho salmon fry prefer pools or other slower velocity areas such as alcoves, with woody debris or overhanging vegetation. Juvenile Coho salmon over-winter in slow water habitat with cover as well. Juveniles may rear in fresh water for up to 15 months then migrate to the ocean as smolts from March to June (Weitkamp, *et al.* 1995). Coho salmon adults typically spend two years in the ocean before returning to their natal streams to spawn as three-year olds.

Available historical and most recent published Coho salmon abundance information are summarized in the NOAA-Fisheries coast-wide status review (Weitkamp, *et al.* 1995). The rivers and tributaries in the California portion of this ESU were estimated to have average recent runs of 7,080 natural spawners and 17,156 hatchery returns, with 4,480 identified as native fish occurring in tributaries having little history of supplementation with non-native fish. However, limited information exists regarding Coho salmon abundance in the Klamath River basin. What information exists [CDFW unpublished data; U.S. Fish and Wildlife Service (USFWS) unpublished data] suggests adult populations are small to nonexistent in most years. The decline of SONCC Coho salmon across the ESU is not the result of one single factor, but rather a number of natural and anthropogenic factors that include dam construction, instream flow alterations; land use activities coupled with large flood events, fish harvest and hatchery effects.

Fish Creek – Coho Surveys

No surveys specifically targeting Coho been completed in Fish Creek. A survey quantifying distribution of various fish species in the Grider Creek and its tributaries was conducted in 1981, with no Coho observed in Fish Creek (Kucas 1981). This stream is not considered to be suitable habitat for this species.

The District Fish Biologist visited Fish Creek in July 2013 to check for fish and examine general habitat condition. Fish Creek is within the range of Coho where it confluence with Grider Creek. However, a ~4 foot plunging falls immediately above the mouth prevents access at all but the highest flood flows (as evidenced by resident rainbow trout upstream). No suitable spawning or rearing habitat for Coho was observed.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Coho distribution maps do not include Fish Creek

Unpublished data and/or field notes from: 2013.

Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

Kuntz Creek – Coho Surveys

Coho have not been documented in Kuntz Creek. General habitat suitability is unknown, but the culvert under Highway 96 is a fish barrier (CDFW 2014; professional judgment). Additionally, the steep gradient, exposed, boulder rip-rap material between culvert and Klamath River (less than 100 feet) is not suitable habitat. A presence/absence survey in 2005 did not observe Coho.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Coho distribution maps do not include Kuntz Creek

Unpublished data and/or field notes from: 2005, 2013

California Department Fish and Wildlife (CDFW). 2014. California Department of Fish and Game Passage Assessment Database. Query performed on 3/25/14.

O'Neil Creek – Coho Surveys

Coho have been observed in O'Neil Creek. Snorkle surveys conducted by Forest Service or Karuk Tribe crew in 2002, 2003, 2005, and 2011 reported juvenile Coho. Fish surveys conducted in conjunction with habitat assessment in 2007 did not observe Coho. Prior to 2006, a culvert under Highway 96 limited Coho occupancy to about 500 feet of channel. Although the culvert has been replaced by a bridge, design deficiencies have continued to prevent fish passage (CDFS 2014). The bridge was scheduled to complete upgrades to address this issue (CalTrans 2013). A comprehensive review of datasets originating from multiple agencies/entities was conducted by

CDFW, with the conclusion that Coho presence in O'Neil Creek <u>was</u> substantiated (Garwood 2012).

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Coho distribution maps do include O'Neil Creek

Unpublished data and/or field notes from: 2002, 2003, 2005, 2007, 2011

Califoria Department of Transportation (CalTrans). 2013. Coastal anadromous fish passage assessment and remediation progress report. Annual report to the legislature for annual year 2012. Califoria Department of Transportation, Sacramento, CA. 12 pp.

California Department Fish and Wildlife (CDFW). 2014. California Department of Fish and Game Passage Assessment Database. Query performed on 3/25/14.

Garwood, J. 2012. Historic and recent occurrence of Coho salmon (*Onchorhynchus kisutch*) in California streams within the Southern Oregon/Northern California Evolutionarily Significant Unit. Fisheries Branch Administrative Report, 2012-03. California Department Fish and Wildlife, Arcata, CA. 77 pp.

Macks Creek – Coho Surveys

No surveys targeting Coho been completed in Macks Creek – this stream is not considered to be suitable habitat for this species. Additionally, the culvert under Highway 96 (perched, >6 foot water freefall to pool) is a complete fish barrier (professional judgment).

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Coho distribution maps do not include Macks Creek

Unpublished data and/or field notes from: 2013

Mill Creek – Coho Surveys

No surveys targeting Coho have been completed in Mill Creek. General habitat suitability is unknown, but the culvert under Highway 96 is a fish barrier (CDFW 2014; professional judgment). Additionally, the steep gradient, exposed, boulder rip-rap and cobble alluvium material between culvert and Klamath River (less than 100 feet) is not suitable habitat.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Coho distribution maps do not include Mill Creek

Unpublished data and/or field notes from: 2013

California Department Fish and Wildlife (CDFW). 2014. California Department of Fish and

Game Passage Assessment Database. Query performed on 3/25/14.

Middle Creek – Coho Surveys

Coho have not been observed in Middle Creek. Multi-agency survey efforts specifically targeting spawning Coho occurred in the winters of 2001/02, 2002/03, and 2004/05, with neither redds nor fish observed (NCRC 2002, 2003; RCD 2005). Snorkel surveys conducted by Forest Service or contract crew in 1989, 1996, 1997, 1998, and 2005 did not report Coho, and nor did an ocular survey in 1980 (unpub. data; USFS 2006). A steep gradient at the confluence with Scott Creek, cumulating in a series of shallow bedrock chutes and a 4+ foot waterfall about 300 feet upstream from the mouth is considered to be a barrier to occupation. A comprehensive review of datasets originating from multiple agencies/entities was conducted by CDFW, with the conclusion that Coho presence in Middle Creek <u>was not</u> substantiated (Garwood 2012).

*CalFish query performed on 3/25/2014

- See project record for expanded datasets referred in summary
- No live/dead fish counts available
- Coho distribution maps do not include Middle Creek

Unpublished data and/or field notes from: 1989, 1996, 1997

U.S. Forest Service. 1998. Juvenile fish survey – Middle Creek. Unpub. data.

U.S. Forest Service. 1980. Stream survey – Middle Creek. Unpub. data.

Garwood, J. 2012. Historic and recent occurrence of Coho salmon (*Onchorhynchus kisutch*) in California streams within the Southern Oregon/Northern California Evolutionarily Significant Unit. Fisheries Branch Administrative Report, 2012-03. California Department Fish and Wildlife, Arcata, CA. 77 pp.

Northern California Resource Center (NCRC). 2003. Scott River watershed adult Coho salmon spawning survey: December 2002 – January 2003. Report prepared by Northern California Resource Center for Siskiyou Resource Conservation Service (Etna, CA) and California Department of Fish and Game (Yreka, CA). 48 pp + appendices.

Northern California Resource Center (NCRC). 2002. Scott River watershed adult Coho salmon spawning survey: December 2001 – January 2002. Report prepared by Northern California Resource Center for Klamath National Forest, Scott River, Fort Jones, CA. 30 pp + appendices.

Siskiyou Resource Conservation District (RCD). 2005. Scott River watershed adult Coho spawning ground surveys: November 2004 – January 2005. Report prepared by Siskiyou Resource Conservation District for U.S. Fish and Wildlife Service (Yreka, CA) [Agreement #113333J027] and California Department of Fish and Game (Yreka, CA) [Agreement #P0310331). 42 pp + appendices.

U.S. Forest Service. 2006. Habitat utilization by juvenile Coho salmon in selected tributaries of the Scott River, 2005. Report prepared by Northern California Resource Center for Klamath National Forest, Scott River, Fort Jones, CA. 31 pp + appendices.

Rancheria Creek – Coho Surveys

This stream is not considered to be suitable habitat for this species. No surveys specifically targeting Coho been completed in Rancheria Creek. Surveys quantifying distribution of various fish species in the Grider Creek and its tributaries were conducted in 1981 and 1988, with no Coho observed in Rancheria Creek (Kucas 1981; Clearwater BioSciences 1988). A comprehensive review of datasets originating from multiple agencies/entities was conducted by CDFW, with the conclusion that Coho presence in Rancheria Creek was not substantiated (Garwood 2012).

The District Fish Biologist visited Rancheria Creek in July 2013 to check for fish and examine general habitat condition. Rancheria Creek is within the range of Coho where it confluences with Grider Creek. No suitable spawning for Coho was observed; and due to the higher gradient nature of the creek, juvenile rearing would be limited. Additionally, a bedrock chute near the mouth would also likely limit juvenile access. No Coho were observed during snorkeling.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Coho distribution maps do not include Rancheria Creek

Unpublished data and/or field notes from: 2013

Clearwater BioSciences, Inc. 1988. Fish habitat characteristics and salmonid abundance in the Grider Creek drainage during June 1988. Prepared for Klamath National Forest, P.O. # 40-91W8-8-1572. 18 pp + appendices.

Garwood, J. 2012. Historic and recent occurrence of Coho salmon (*Onchorhynchus kisutch*) in California streams within the Southern Oregon/Northern California Evolutionarily Significant Unit. Fisheries Branch Administrative Report, 2012-03. California Department Fish and Wildlife, Arcata, CA. 77 pp.

Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

Tompkins Creek – Coho Surveys

Coho have been observed in Tompkins Creek. Multi-agency survey efforts specifically targeting spawning Coho occurred in the winters of 2001/02, 2002/03, and 2004/05 (NCRC 2002, 2003; RCD 2005; USFS 2006). Other Coho spawning surveys occurred in 2006/07, 2009/10, 2010/11, and 2011/12 with redds reported in 2009/10 (RCD 2010, Knechtle and Chesney 2012). Dive surveys conducted by Forest Service or contracted personnel in 1989 and 2005 encountered Coho juveniles. The upstream extent of Coho is not well defined, but is believed to be near the Road 46N64 bridge crossing of Tompkins Creek, upstream of which discharge and steep gradients are presumed to inhibit upward movement of fish, a total distance of about 2.8 miles. In 2005, a possible barrier to upward movement of Coho was reported at about 1.5 miles (USFS 2006). A comprehensive review of datasets originating from multiple agencies/entities was conducted by

CDFW, with the conclusion that Coho presence in Tompkins Creek was substantiated (Garwood 2012).

*CalFish query performed on 3/25/2014

- See project record for expanded datasets referred in summary
- No live/dead fish counts available
- Coho distribution maps do include Tompkins Creek

Redd Count

- CalFish records available (1): 91423
    - Inclusive years (all datasets): 2001/2002, 2002/2003
- Summary: No redds recorded

Unpublished data and/or field notes from: 1989, 2006

Garwood, J. 2012. Historic and recent occurrence of Coho salmon (*Onchorhynchus kisutch*) in California streams within the Southern Oregon/Northern California Evolutionarily Significant Unit. Fisheries Branch Administrative Report, 2012-03. California Department Fish and Wildlife, Arcata, CA. 77 pp.

Knechtle, M., and D. Chesney. 2012. 2011 Scott River salmon studies final report. California Department Fish and Wildlife, Northern Region, Yreka, CA. 21 p.

Northern California Resource Center (NCRC). 2003. Scott River watershed adult Coho salmon spawning survey: December 2002 – January 2003. Report prepared by Northern California Resource Center for Siskiyou Resource Conservation Service (Etna, CA) and California Department of Fish and Game (Yreka, CA). 48 pp + appendices.

Northern California Resource Center (NCRC). 2002. Scott River watershed adult Coho salmon spawning survey: December 2001 – January 2002. Report prepared by Northern California Resource Center for Klamath National Forest, Scott River, Fort Jones, CA. 30 pp + appendices.

Siskiyou Resource Conservation District (RCD). 2010. Unpubl. map – Scott River Coho surveys, Coho redds, 2010.

Siskiyou Resource Conservation District (RCD). 2005. Scott River watershed adult Coho spawning ground surveys: November 2004 – January 2005. Report prepared by Siskiyou Resource Conservation District for U.S. Fish and Wildlife Service (Yreka, CA) [Agreement #113333J027] and California Department of Fish and Game (Yreka, CA) [Agreement #P0310331). 42 pp + appendices.

U.S. Forest Service. 2006. Habitat utilization by juvenile Coho salmon in selected tributaries of the Scott River, 2005. Report prepared by Northern California Resource Center for Klamath National Forest, Scott River, Fort Jones, CA. 31 pp + appendices.

Tyler Meadow Creek – Coho Surveys

No surveys specifically targeting Coho been completed in Tyler Meadow Creek. A survey quantifying distribution of various fish species in the Grider Creek and its tributaries was conducted in 1981, with no Coho observed in Tyler Meadow Creek (Kucas 1981). This stream is not considered to be suitable habitat for this species.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Coho distribution maps do not include Tyler Meadow Creek

Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

Scott River – Coho Surveys

Coho are present in the Scott River in the general project area, with a focus on the reach between Scott Bar and Middle Creek. Specifics concerning suitability of the river in this location for spawning is poorly known due to often hazardous discharge conditions which are present in winter. However, the rotary screw trap operated by the CDFW annually records downmigrating smolts in the spring (Daniels, *et al.* 2011); and the video weir upstream of Indian Scotty Campground captures at least part of the spawning run in the late-fall/early-winter (Knechtle and Chesney 2014).

*Location restricted, where possible, to general Project area (Scott Bar to Middle Creek)
*CalFish query performed on 3/25/2014

- See project record for expanded datasets referred in summary
- Coho distribution maps include the Scott River in the Project area

Live/Dead Fish Count

- CalFish records available (1): 90359
  - Inclusive years (all datasets): 1992-1997
- Summary: Coho recorded 1993-1996
- Note: specific locations not provided, but often mouth to Fort Jones

Redd Count

- CalFish records available (1): 91419
  - Inclusive years (all datasets): 2002-2012
- Summary: Redds recorded 2008, 2009
- Note: specific locations not provided, but likely similar reaches as Fall Chinook spawning surveys; high flows may make comprehensive surveys difficult

Other – Weir Operations (near mouth)

- CalFish records available (2): 90418, 90419
  - Inclusive years (all datasets): 1983-1991
- Summary: Coho recorded all years

Daniels, S., Debrick, A., Diviney, C., Underwood, K., Stenhouse, S., and W. Chesney. 2011. Final report Shasta and Scott River juvenile salmonid outmigrant study, 2010. Report #P071307. California Department of Fish and Game, Northern Region, Yreka, CA. 97 p.

Knechtle, M., and D. Chesney. 2014. 2013 Scott River salmon studies final report. California Department Fish and Wildlife, Northern Region, Yreka, CA. 23 p.

Grider Creek – Coho Surveys

Coho have been observed in Grider Creek. Large-scale fish distribution surveys of the Grider Creek drainage, including its tributaries, were first conducted in 1981 (Kucas 1981), and again in 1988 (Clearwater BioSciences 1988). Coho juveniles were found during both surveys. More recently, fish surveys reporting upon juveniles were conducted in most years 2002 through 2013. While some of the surveys specifically targeted Coho, fish were also incidentally reported during Spring Chinook/Summer Steelhead, Fall Chinook, and other surveys. Specifics concerning use of the creek for spawning is poorly known due to often hazardous discharge conditions which are present in winter, as well as snow creating access difficulties. Spawning surveys completed in 2008/2009 found nothing (Corum 2010). The upstream extent of Coho was originally believed to be an 8 foot waterfall barrier upstream of the Rancheria Creek (Kucas 1981; Clearwater BioSciences 1988), but Coho have since been found above. A comprehensive review of datasets originating from multiple agencies/entities was conducted by CDFW, with the conclusion that Coho presence in Grider Creek was substantiated (Garwood 2012).

*CalFish query performed on 3/25/2014
- No redd counts available
- See project record for expanded datasets referred in summary
- Coho distribution maps include Grider Creek

Live/Dead Fish Count
- CalFish records available (1): 91565
    - Inclusive years (all datasets): 2001-2003
- Summary: Carcasses (adult) and/or juveniles noted

Unpublished data and/or field notes from: 2002-2013

Corum, A. 2010. Draft middle Klamath tributary Coho spawning survey report – 2007/2008. Report prepared for U.S. Department of the Interior, Bureau of Reclamation by A. Corum, Karuk Tribe. 6 pp.

Clearwater BioSciences, Inc. 1988. Fish habitat characteristics and salmonid abundance in the Grider Creek drainage during June 1988. Prepared for Klamath National Forest, P.O. # 40-91W8-8-1572. 18 pp + appendices.

Garwood, J. 2012. Historic and recent occurrence of Coho salmon (*Onchorhynchus kisutch*) in California streams within the Southern Oregon/Northern California Evolutionarily Significant Unit. Fisheries Branch Administrative Report, 2012-03. California Department Fish and Wildlife, Arcata, CA. 77 pp.

Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

Klamath River – Coho Surveys

Coho are present in the Klamath River in the general project area, with a focus on the reach in the vicinity of Hamburg. Specifics concerning suitability of the river in this location for spawning is poorly known due to often hazardous discharge conditions which are present in winter. However, surveys for Coho juveniles during the summer do find utilization at tributary confluences and thermal refugia (Sutton and Soto 2010).

*Location restricted to general Project area (Hamburg vicinity)
*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Coho distribution maps do include Klamath River

Unpublished data and/or field notes from: 2002-2013

Sutton, R., and T. Soto. 2010. Juvenile Coho salmon behavioral characteristics in Klamath River summer thermal refugia. *River Research and Applications* 28: 338-346.

Chinook Salmon

The following information was excerpted or summarized from NMFS status review of Chinook salmon (Meyers, *et al*. 1998). Chinook salmon mature between 2 and 6+ years of age (Meyers, *et al*. 1998). Fall-run Chinook salmon enter freshwater at an advanced stage of maturity, move rapidly to their spawning areas on the mainstem or lower tributaries of the rivers, and spawn within a few days or weeks of freshwater entry (Healey 1991). Incubation temperature for eggs is 5.0 to 14.4°C, with below 13.0°C preferred for optimal development in most stocks (McCullough 1999). Emerging fry generally do not develop normally above 12.8°C (McCullough 1999). Post-emergent fry seek out shallow, nearshore areas with slow current and good cover, and begin feeding on small terrestrial and aquatic insects and aquatic crustaceans. Once feeding, the optimal growth range for juveniles is 10.0 to 15.6°C, with fingerlings preferring to hold at 12 to 14°C (McCullough 1999). In preparation for their entry into a saline environment, juvenile salmon undergo physiological transformations known as smoltification that adapt them for their transition to salt water. For Chinook salmon, the recommended maximum temperature to maintain migratory response and seaward adaptation is 12.0°C; and at temperatures greater than 13.0°C, some physiological processes of smolting may be delayed, and, in extreme cases, reversed (McCullough 1999). Chinook salmon spend between one and four years in the ocean before returning to their natal streams to spawn (Meyers, *et al*. 1998). Chinook salmon addressed in this document exhibit an ocean-type life history, and smolts out-migrate predominantly as subyearlings, generally during April through July. Chinook salmon spend between 2 and 5 years in the ocean (Healey 1991), before returning to freshwater to spawn. Some Chinook salmon return from the ocean to spawn one or more years before full-sized adults return.

The UKT ESU includes fall- and spring-run Chinook salmon in the Klamath and Trinity River Basin upstream of the confluence of the Klamath and Trinity rivers. Historically, spring-run Chinook salmon were probably the predominate run. This ESU still retains several distinct spring-run populations, albeit at much reduced abundance levels. Fish from this ESU exhibit an ocean-type life history; however genetically and physically, these fish are quite distinct from coastal and Central Valley Chinook salmon ESUs. Genetic analysis indicated that this ESU form a unique group that is quite distinctive compared to neighboring ESUs. The majority of spring- and fall-run fish emigrate to the marine environment primarily as subyearlings, but have a significant proportion of yearling smolts. Recoveries of coded wire tags indicate that both runs have a coastal distribution off the California and Oregon coasts. The 2013 fall-run Chinook salmon run into the Klamath River system, as compiled by CDFW, was estimated to be 179,541 fish (165,125 adult and 14,416 grilse) (CDFW 2014). Of the 69,986 basin-wide natural spawners (i.e., not of hatchery origin), 2,480 were from the Salmon River and 4,624 from the Scott River. The Klamath River run in 2014 was projected to be above recent historical average (KRTT 2014).

Fish Creek – Chinook Surveys

No surveys specifically targeting Chinook been completed in Fish Creek. A survey quantifying distribution of various fish species in the Grider Creek and its tributaries was conducted in 1981, with no Chinook observed in Fish Creek (Kucas 1981). Additionally, Fish Creek is about 2.4 miles upstream on Grider Creek from the barrier which is considered to be the upstream limit of Chinook in the system. Therefore, this stream is not considered to be suitable habitat for this species.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Chinook distribution maps do not include Fish Creek

Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

Kuntz Creek – Chinook Surveys

Coho have not been documented in Kuntz Creek. General habitat suitability is unknown, but the culvert under Highway 96 is a fish barrier (CDFW 2014; professional judgment). Additionally, the steep gradient, exposed, boulder rip-rap material between culvert and Klamath River (less than 100 feet) is not suitable habitat. A presence/absence survey in 2005 did not observe Chinook.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Chinook distribution maps do not include Kuntz Creek

Unpublished data and/or field notes from: 2005, 2013

California Department Fish and Wildlife (CDFW). 2014. California Department of Fish and Game Passage Assessment Database. Query performed on 3/25/14.

O'Neil Creek – Chinook Surveys

Chinook have been observed in O'Neil Creek. Snorkle surveys for juvenile fish conducted by Forest Service or Karuk Tribe crew in 2003 and 2005 reported juvenile Chinook. Similar surveys in 2002 and 2011 did not see Chinook; and nor did fish surveys conducted in conjunction with habitat assessment in 2007. Prior to 2006, a culvert under Highway 96 limited Coho occupancy to about 500 feet of channel. Although the culvert has been replaced by a bridge, design deficiencies have continued to prevent fish passage (CDFS 2014). The bridge was scheduled to complete upgrades to address this issue (CalTrans 2013).

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Chinook distribution maps do not include O'Neil Creek

Unpublished data and/or field notes from: 2002, 2003, 2005, 2007, 2011

Califoria Department of Transportation (CalTrans). 2013. Coastal anadromous fish passage assessment and remediation progress report. Annual report to the legislature for annual year 2012. Califoria Department of Transportation, Sacramento, CA. 12 pp.

California Department Fish and Wildlife (CDFW). 2014. California Department of Fish and Game Passage Assessment Database. Query performed on 3/25/14.

Macks Creek – Chinook Surveys

No surveys targeting Chinook been completed in Macks Creek – this stream is not considered to be suitable habitat for this species. Additionally, the culvert under Highway 96 (perched, >6 foot water freefall to pool)is a complete fish barrier (professional judgment).

*CalFish query performed on 3/25/2014
- No live/dead fish nor redd counts available
- Chinook distribution maps do not include Macks Creek

Unpublished data and/or field notes from: 2013

Mill Creek – Chinook Surveys

No surveys targeting Chinook have been completed in Mill Creek. General habitat suitability is unknown, but the culvert under Highway 96 is a fish barrier (CDFW 2014; professional judgment). Additionally, the steep gradient, exposed, boulder rip-rap and cobble alluvium material between culvert and Klamath River (less than 100 feet) is not suitable habitat.

*CalFish query performed on 3/25/2014
- No live/dead fish nor redd counts available
- Chinook distribution maps do not include Mill Creek

Unpublished data and/or field notes from: 2013

California Department Fish and Wildlife (CDFW). 2014. California Department of Fish and Game Passage Assessment Database. Query performed on 3/25/14.

Middle Creek – Chinook Surveys

Chinook have not been observed in Middle Creek. Snorkel surveys conducted by Forest Service or contract crew in 1989, 1996, 1997, 1998, and 2005 did not report Chinook, and nor did an ocular survey in 1980. A steep gradient at the confluence with Scott Creek, cumulating in a series of shallow bedrock chutes and a 4+ foot waterfall about 300 feet upstream from the mouth is considered to be a barrier to occupation.

*CalFish query performed on 3/25/2014
- No live/dead fish nor read counts available
- Chinook distribution maps do not include Middle Creek

Unpublished data and/or field notes from: 1989, 1996, 1997
U.S. Forest Service. 1998. Juvenile fish survey – Middle Creek. Unpub. data.
U.S. Forest Service. 1980. Stream survey – Middle Creek. Unpub. data.

U.S. Forest Service. 2006. Habitat utilization by juvenile Coho salmon in selected tributaries of the Scott River, 2005. Report prepared by Northern California Resource Center for Klamath National Forest, Scott River, Fort Jones, CA. 31 pp + appendices.

Rancheria Creek – Chinook Surveys

No surveys specifically targeting Chinook been completed in Rancheria Creek. Surveys quantifying distribution of various fish species in the Grider Creek and its tributaries were conducted in 1981 and 1988, with no Chinook observed in Rancheria Creek (Kucas 1981; Clearwater BioSciences 1988). This stream is not considered to be suitable habitat for this species.

The District Fish Biologist visited Rancheria Creek in July 2013 to check for fish and examine general habitat condition. Rancheria Creek is within the range of Chinook where it confluences with Grider Creek. No suitable spawning for Chinook was observed; and due to the higher gradient nature of the creek, juvenile rearing would be limited. Additionally, a bedrock chute near the mouth would also likely limit juvenile access. No Chinook were observed during snorkeling.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Chinook distribution maps do not include Rancheria Creek

Unpublished data and/or field notes from: 2013

Clearwater BioSciences, Inc. 1988. Fish habitat characteristics and salmonid abundance in the Grider Creek drainage during June 1988. Prepared for Klamath National Forest, P.O. # 40-91W8-8-1572. 18 pp + appendices.

Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

Tompkins Creek – Chinook Surveys

Chinook have not been observed in Tompkins Creek. Spawning surveys have been conducted in 1996, 2010, 2012, and 2013, but neither fish nor redds have been found. Additionally, numerous surveys targeting rearing Coho or steelhead/rainbow trout have occurred (see respective sections), yet no juvenile Chinook have ever been seen. It is unclear why Chinook do not use Tompkins Creek, but the mouth may not support sufficient discharge in the fall for this species to successfully enter the system. Additionally, while spawning substrate suitable for Chinook may be available, it tends to be patchy; and the small size of the creek relative to the size of an adult fish, along with a general lack of deep pools, creates high vulnerability to spawners to predators.

*CalFish query performed on 3/25/2014

- No live/dead fish or redd counts available
- Chinook distribution maps do not include Tompkins Creek

Unpublished data and/or field notes from: 1996, 1996, 1997, 2010, 2012, 2013

Tyler Meadow Creek – Chinook Surveys

No surveys specifically targeting Chinook been completed in Tyler Meadow Creek. A survey quantifying distribution of various fish species in the Grider Creek and its tributaries was conducted in 1981, with no Chinook observed in Tyler Meadow Creek (Kucas 1981). This stream is not considered to be suitable habitat for this species.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Chinook distribution maps do not include Tyler Meadow Creek

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Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

Scott River – Chinook Surveys

Chinook are present in the Scott River in the general project area, with a focus on the reach between Scott Bar and Middle Creek. Although individual agencies may have been conducting fish and/or redd surveys upon the Scott River for decades, cooperative multi-entity fall Chinook spawning surveys have occurred annually since 1992 (most recent reports: Meneks 2014 [USFS] and Knechtle and Chesney 2014 [CDFW]). Additionally, the rotary screw trap operated by the CDFW annually records downmigrating smolts in the spring (Daniels, *et al.* 2011); and the video weir upstream of Indian Scotty Campground captures the portion of the fall spawning run destined for the Scott River Valley and upper canyon area (Knechtle and Chesney 2013). Finally, dive investigations into the presence/absence of spring Chinook occurred 2007 through 2009, with one adult Chinook seen in 2008 within the deep pools of the Scott River adjacent the Project area (QVIR 2010).

*Location restricted, where possible, to general Project area (Scott Bar to Middle Creek)
*CalFish query performed on 1/30/2013

- See project record for expanded datasets referred in summary
- Chinook distribution maps include the Scott River in the Project area

Live/Dead Fish Count

- CalFish records available (1): 90361
  - Inclusive years (all datasets): 1983-1986, 1992-1997
- Summary: Chinook recorded all years
- Note: specific locations not provided, but often mouth to Fort Jones

Redd Count

- CalFish records available (2): 90716, 91006

    - Inclusive years (all datasets): 1964-1972, 1974-1978, 1988, 1989, 1991-1997
- Summary: Redds recorded all years
- Note: specific locations not provided, but often "entire mainstem"

Other – Weir Operations (near mouth)

- CalFish records available (2): 90406, 90407
    - Inclusive years (all datasets): 1983-1991
- Summary: Chinook recorded all years

Other – Population Estimates

- CalFish records available (2): 90673, 90700
    - Inclusive years (all datasets): 1968, 1978-2013
- Summary: Chinook recorded all years

Daniels, S., Debrick, A., Diviney, C., Underwood, K., Stenhouse, S., and W. Chesney. 2011. Final report Shasta and Scott River juvenile salmonid outmigrant study, 2010. Report #P071307. California Department of Fish and Game, Northern Region, Yreka, CA. 97 p.

Knechtle, M., and D. Chesney. 2014. 2013 Scott River salmon studies final report. California Department Fish and Wildlife, Northern Region, Yreka, CA. 23 p.

Meneks, M. 2014. 2013 Fall Chinook spawning ground survey – Salmon-Scott Rivers Ranger District. Klamath National Forest, Salmon-Scott Rivers Ranger District, Fort Jones, CA. 18 pp + appendices.

Quartz Valley Indian Reservation (QVIR). 2010. 2007-2009 summer steelhead, spring Chinook, and Pacific lamprey dive surveys, Scott River, CA. Quartz Valley Indian Reservation, CA. 16 pp.

Grider Creek – Chinook Surveys

Chinook have been observed in Grider Creek. Large-scale fish distribution surveys of the Grider Creek drainage, including its tributaries, were first conducted in 1981 (Kucas 1981), and again in 1988 (Clearwater BioSciences 1988). Chinook juveniles were found during both surveys. More recently, fish surveys reporting upon juveniles were conducted in most years 2002 through 2013. Juvenile Chinook were generally not the target, but were incidentally reported during Coho presence/absence, Spring Chinook/Summer Steelhead, or Fall Chinook surveys. Although spring-run Chinook have been confirmed in Grider Creek, they appear to be rare (Kucas 1981; USFS 1995). Spring Chinook/Summer Steelhead surveys have been conducted most years 2001 through 2013, have not observed adult spring Chinook. Much more numerous are the fall Chinook, which have been annually surveyed by CDFW and USFS since 1997, with additional records as early as 1988 (most recent report: Knechtle and Borok 2009 [CDFW]; unpub. data). The upstream extent of Chinook is an 8 foot waterfall barrier upstream of the Rancheria Creek (Kucas 1981; Clearwater BioSciences 1988).

*CalFish query performed on 3/25/2014

- See project record for expanded datasets referred in summary

- Chinook distribution maps include Grider Creek

Live/Dead Fish Count

- CalFish records available (1): 91460
    - Inclusive years (all datasets): 2001-2005
- Summary: No Chinook seen

Redd Count

- CalFish records available (2): 90714, 91564
    - Inclusive years (all datasets): 1988-1992, 2001-2003
- Summary: Redds recorded every year

Unpublished data and/or field notes from: 1988, 1989, 2002-2013, 1984-2013

Clearwater BioSciences, Inc. 1988. Fish habitat characteristics and salmonid abundance in the Grider Creek drainage during June 1988. Prepared for Klamath National Forest, P.O. # 40-91W8-8-1572. 18 pp + appendices.

Knechtle, M., and S. Borok. 2009. Mid Klamath cooperative spawning ground survey, 2009. Agreement Number: 813339H001; Project Number: 2009-FISHERIES-FP-01. California Department of Fish and Wildlife, Northern Region, Yreka, CA. 8 pp.

Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

U.S. Forest Service (USFS). 1995. Summer steelhead/spring Chinook summer holding survey, Scott River 1995 (draft report). Scott River Ranger District. 4 pp.

Klamath River – Chinook Surveys

Chinook are present in the Klamath River in the general project area, with a focus on the reach in the vicinity of Hamburg. Specifics concerning the use of the river in this location for spawning may be less well described due to large size of the system requiring use of float boat or plane. However, surveys for Chinook juveniles during the summer do find utilization at tributary confluences and thermal refugia (Belchik 2003).

*Location restricted to general Project area (Hamburg vicinity)
*CalFish query performed on 3/25/2014

- No live/dead fish counts available
- Coho distribution maps do include Klamath River

Redd Count

- CalFish records available (2): 90397, 91590
    - Inclusive years (all datasets): 1972, 1977, 1978, 1993-2004
- Summary: Redds recorded every year
- Note: specific locations not provided – “Iron Gate Dam downstream to the Indian Creek confluence”

Unpublished data and/or field notes from: 2002-2013

Belchik, M. 2003. Use of thermal refugial areas on the Klamath River by juvenile salmonids, summer 1998. Report in fulfillment of Grant #8-FG-20-17510. Yurok Tribe. 36 pp.

Steelhead

Biologically, steelhead can be divided into two basic run-types, based on the state of sexual maturity at the time of river entry and duration of spawning migration (Moyle 2002). The stream-maturing type, or summer steelhead, enters fresh water in a sexually immature condition and requires several months in freshwater to mature and spawn. The ocean-maturing type, or winter steelhead, enters fresh water with well-developed gonads and spawns shortly after river entry (August 9, 1996, 61 FR 41542; Barnhart 1986). South of Cape Blanco, Oregon, summer steelhead are known to occur in the Rogue, Smith, Klamath, Trinity, Mad, and Eel rivers, and in Redwood Creek (Busby, *et al.* 1996).

Winter steelhead in California enter fresh water after rivers rise in response to fall/winter rains, typically from December through March, with a peak in January and February, with spawning soon after reaching the breeding grounds (Moyle 2002). In contrast, summer steelhead enter systems as flows taper off in the spring, then spawn the following winter (Moyle 2002). Steelhead require a minimum depth of 0.18 m and a maximum velocity of 2.44 m/s for active upstream migration (Smith 1973). Spawning and initial rearing of juvenile steelhead generally take place in small, moderate-gradient (generally 3-5%) tributary streams (Nickelson, *et al.* 1992). A minimum depth of 0.18 m, water velocity of 0.30-0.91 m/s, and clean substrate 0.6-10.2 cm (Nickelson, *et al.* 1992) are required for spawning. Steelhead spawn in 3.9-9.4°C water (Bell 1991). Depending on water temperature, steelhead eggs may incubate for 1.5 to 4 months (August 9, 1996, 61 FR 41542) before hatching, generally between February and June (Bell 1991). After two to three weeks, in late spring, and following yolk sac absorption, alevins emerge from the gravel and begin actively feeding. After emerging from the gravel, fry usually inhabit shallow water along banks of perennial streams. Fry occupy stream margins (Nickelson, *et al.* 1992). Summer rearing takes place primarily in the faster parts of pools, although young-of-the-year are abundant in glides and riffles. Winter rearing occurs more uniformly at lower densities across a wide range of fast and slow habitat types. Productive steelhead habitat is characterized by complexity, primarily in the form of large and small wood. Some older juveniles move downstream to rear in larger tributaries and mainstem rivers (Nickelson, *et al.* 1992). Steelhead prefer water temperatures ranging from 12-15°C (Reeves *et al.* 1987). Juveniles live in freshwater from one to four years (usually two years in the California ESUs), then smolt and migrate to the ocean in March and April (Barnhart 1986). Winter steelhead populations generally smolt after two years in fresh water (Busby, *et al.* 1996).

The KMP steelhead ESU occurs in coastal river basins between the Elk River in Oregon and the Klamath River in California, inclusive. The KMP steelhead ESU contains populations of both winter and summer steelhead. The Rogue and Klamath River basins are distinctive in that they are two of the few basins producing "half-pounder" steelhead. In 2001, NOAA-Fisheries reconsidered the status of KMP steelhead under the ESA (66 FR 17845, April 4, 2001) and determined that KMP steelhead do not warrant listing as threatened or endangered at this time.

In California, the largest proportions of naturally spawning hatchery fish are believed to occur in the Trinity River, where estimates from 1990s range from 20-70 percent hatchery. These estimates apply to fall-run fish. Because the hatchery program in the Trinity River basin propagates mostly fall-run fish, natural spawners in this basin that return at other times are believed to be predominantly of natural origin. Counts at Willow Creek weir provide an estimate of about 2000 natural origin fall-run spawners per year. The Willow Creek weir samples steelhead only over a period of about 3 months during the fall run and thus provides no information about other runs in the basin. CDFW biologists estimated natural escapement in the California portion of the ESU to be approximately 30,000-50,000 adults per year.

Fish Creek – Steelhead/Rainbow Trout Surveys

Resident rainbow trout are present in Fish Creek, but steelhead are not. A survey quantifying distribution of various fish species in the Grider Creek and its tributaries was conducted in 1981, with resident rainbow trout observed in Fish Creek (Kucas 1981). Approximately 0.2 miles of the creek was considered to be suitable habitat.

The District Fish Biologist visited Fish Creek in July 2013 to check for fish and examine general habitat condition. Rainbow trout were observed above a ~4 foot plunging falls immediately above the mouth, continuing about 0.1 mile to a where it plunged over a ~5 foot tumble of boulder that appears to be the upstream limit of fish. Above the boulders was a 50 foot long bedrock chute; and then an already high gradient channel became steeper. Distance of fish occupation broadly aligns with the estimates made in the 1981 survey.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Steelhead distribution maps do not include Fish Creek

Unpublished data and/or field notes from: 2013

Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

Kuntz Creek – Steelhead/Rainbow Trout Surveys

Resident rainbow trout are present in Kuntz Creek, but steelhead are not. Total occupation is estimated to be 0.8 miles above the mouth. The culvert under Highway 96 is a barrier to upmigrating anadromous fish (CDFW 2014; professional judgment). Additionally, the steep gradient, exposed, boulder rip-rap material between culvert and Klamath River (less than 100 feet) is not suitable fish habitat. Although a presence/absence survey in 2005 reported "steelhead", these fish are considered to be resident rainbow trout due to the culvert barrier: datasheets do not make the distinction between small residents and steelhead due to the impossibility to differentiate the two; and larger sizes are also rarely separated.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Steelhead distribution maps do not include Kuntz Creek

Unpublished data and/or field notes from: 2002-2013, 2013

California Department Fish and Wildlife (CDFW). 2014. California Department of Fish and Game Passage Assessment Database. Query performed on 3/25/14.

O'Neil Creek – Steelhead/Rainbow Trout Surveys

Both steelhead and resident rainbow trout are present in O'Neil Creek. Except in the case of obvious barriers to anadromous fish, snorkel surveys generally do not make distinction between small resident trout and steelhead due to the impossibility to differentiate the two; and larger sizes are also rarely separated. Snorkle surveys conducted by Forest Service or Karuk Tribe crew in 2002, 2003, 2005, and 2011 reported steelhead/rainbow trout, as did fish surveys conducted in conjunction with habitat assessment in 2007. Prior to 2006, a culvert under Highway 96 limited Coho and Chinook occupancy to about 500 feet of channel. However, steelhead/rainbow trout have been observed upstream to approximately 0.9 mile. Although the culvert has been replaced by a bridge, design deficiencies have continued to prevent fish passage (CDFS 2014). The bridge was scheduled to complete upgrades to address this issue (CalTrans 2013).

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Steelhead distribution maps not include O'Neil Creek

Unpublished data and/or field notes from: 2002, 2003, 2005, 2007, 2011

Califoria Department of Transportation (CalTrans). 2013. Coastal anadromous fish passage assessment and remediation progress report. Annual report to the legislature for annual year 2012. Califoria Department of Transportation, Sacramento, CA. 12 pp.

California Department Fish and Wildlife (CDFW). 2014. California Department of Fish and Game Passage Assessment Database. Query performed on 3/25/14.

Macks Creek – Steelhead/Rainbow Trout Surveys

A mapping discrepancy exists for the steelhead distribution maps of both the Klamath National Forest and CalFish.org. Both sources indicate steelhead to be present above a culvert under Highway 96. However, field review of the of the crossing, it is the professional judgment of the District Fish Biologist that the structure is a complete barrier (perched, >6 foot water freefall to pool) to upmigrating anadromous fish. The status of steelhead below the culvert – habitat condition, presence of additional barriers – is not able to be determined due to the presence of private property.

After reviewing the data available, it is the conclusion of the District Fish Biologist, with concurrence from the Forest Fish Biologist, that steelhead presence for Macks Creek should be restricted to the approximately 500 feet between Highway 96 and the Klamath River.

Concerning resident rainbow trout on Macks Creek above Highway 96, although collaborating surveys cannot be located, Klamath National Forest fish distribution maps indicate fish to be present from the confluence of the Klamath River to a distance upstream of about 0.6 miles.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Steelhead distribution maps do include Macks Creek

Unpublished data and/or field notes from: 2013

Mill Creek – Steelhead/Rainbow Trout Surveys

Although collaborating surveys cannot be located, Klamath National Forest fish distribution maps indicate resident rainbow trout to be present on Mill Creek from its confluence with the Klamath River to a distance of about 1.5 miles. There are no records for steelhead presence. The culvert under Highway 96 is a barrier to upmigrating anadromous fish (CDFW 2014; professional judgment). Additionally, the steep gradient, exposed, boulder rip-rap and cobble alluvium material between culvert and Klamath River (less than 100 feet) is not suitable habitat.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Steelhead distribution maps do not include Mill Creek

Unpublished data and/or field notes from: 2013

California Department Fish and Wildlife (CDFW). 2014. California Department of Fish and Game Passage Assessment Database. Query performed on 3/25/14.

Middle Creek – Steelhead/Rainbow Trout Surveys

A mapping discrepancy exists between steelhead distribution maps for Klamath National Forest and CalFish.org. While the former indicates steelhead to be present, the latter does not. After reviewing the data available, it is the conclusion of the District Fish Biologist, with concurrence from the Forest Fish Biologist, that there is no conclusive evidence for steelhead on Middle Creek and that the current Forest distribution map is in error.

Snorkel surveys conducted in 1989, 1996, 1997, and 1998 recorded the presence of age/size 0+ to 3+ "steelhead" trout, which is where the Forest mapping discrepancy may originate. Datasheets do not make the distinction between small resident trout and steelhead due to the impossibility to differentiate the two; and larger sizes are also rarely separated.

Middle Creek begins with a steep gradient at the confluence with Scott Creek, cumulating in a series of shallow bedrock chutes and a 4+ foot waterfall about 300 feet upstream from the mouth. In many surveys, these habitat structures have been considered to be a barrier to occupation by upmigrating fish. For instance, steelhead spawning surveys were conducted on Middle Creek in 1990, 1991, 1992, 1999, and 2002, with neither redds nor fish observed (although resident rainbow trout redds were reported in 1992). Surveyors from two of the years – 1990, 2002 – noted the difficulty of entry to Middle Creek, a persistent steep channel gradient, and overall paucity of suitable spawning substrates. Additionally, a 1989 habitat survey, completed in conjunction with the previously referenced survey that recorded "steelhead", also noted multiple barriers just upstream the mouth. Finally, an ocular survey in 1980 began at the confluence with Scott River and continued upstream until ending at the extreme headwaters, a distance of about 3.4 miles. The 1980 surveyors considered the chutes and waterfalls at the mouth to be an impassible barrier. Fish were recorded throughout the survey distance; and although species is not provided in the notes, old fish distribution maps show resident rainbow trout, not steelhead.

The District Fish Biologist walked approximately 0.5 miles upstream Middle Creek from the mouth in 2013 in order to examine general habitat condition. Similar to past stream surveys, the fish biologist questioned the likelihood of steelhead entering Middle Creek due to multiple barriers near the confluence and continual steep gradient throughout the hiked distance. Furthermore, very few patches of spawning substrate suitable for steelhead use was observed.

*CalFish query performed on 3/25/2014
- No live/dead fish nor read counts available
- Steelhead distribution maps do not include Middle Creek

Unpublished data and/or field notes from: 1989, 1990, 1991, 1992, 1999, 2002, 2013
U.S. Forest Service (USFS). 1998. Juvenile fish survey – Middle Creek. Unpub. data.
U.S. Forest Service (USFS). 1980. Stream survey – Middle Creek. Unpub. data.

Rancheria Creek – Steelhead/Rainbow Trout Surveys

Both steelhead and resident rainbow trout have been observed on Rancheria Creek. Surveys quantifying distribution of various fish species in the Grider Creek and its tributaries, including Rancheria Creek, were conducted in 1981 and 1988. The 1981 survey found rainbow trout within an estimated 1.0 mile of suitable habitat, and suggested the possibility of steelhead downstream of an anadromous fish barrier (at 0.5 miles) (Kucas 1981). The 1988 survey observed rainbow trout, and furthermore encountered steelhead redds below the barrier (Clearwater BioSciences 1988).

The District Fish Biologist visited Rancheria Creek in July 2013 to check for fish and examine general habitat condition. The definite barrier mentioned by Kucas (1981) at 0.5 miles was found, as well as multiple partial barriers downstream, two of which could limit upstream movement by anadromous fish. At least one of these barriers appears relatively new and was probably created since 1981, likely during a flood event such as 1997. While steelhead/rainbow trout were seen downstream of the 0.5 mile barrier, none were seen upstream. However, the investigation did not continue through the entire area as surveyd in 1981 and 1988, and so may have missed resident rainbow trout if they were rare in numbers.

*CalFish query performed on 3/25/2014
- No live/dead fish nor redd counts available
- Steelhead distribution maps do not include Rancheria Creek

Unpublished data and/or field notes from: 2013

Clearwater BioSciences, Inc. 1988. Fish habitat characteristics and salmonid abundance in the Grider Creek drainage during June 1988. Prepared for Klamath National Forest, P.O. # 40-91W8-8-1572. 18 pp + appendices.

Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

Tompkins Creek – Steelhead/Rainbow Trout Surveys

Steelhead and resident rainbow trout have been observed in Tompkins Creek. Steelhead distribution is about 3.7 miles of the mainstem, 0.9 miles of an unnamed "west fork" tributary, and 0.7 miles of an unnamed "north fork" tributary. Resident rainbow trout are within the same range of steelhead, but also inhabit an additional 0.3 miles of the mainstem and about 0.25 miles of an unnamed tributary just above the 46N64 bridge.

Extensive spawning surveys for steelhead have been conducted in Tompkins Creek, including 1980-1986, 1988-1992, 1997-1999, 2002, and 2013. Surveys between 1980 and 1992 all recorded redds and/or live fish, while from 1997 to 2002 found nothing; and the 2013 survey observed three redds. The reason for the difference in observation is likely twofold. First, many of the surveys in the 1980s and early 1990s were investigating escapement, and therefore tended to include multiple visits during the spawning season. Second, notes associated with some of the later surveys report impacts following the 1997 flood that may have decreased spawning habitat suitability. The presence of redds in 2013 indicates appropriate habitat is again available for spawning.

Live fish surveys, generally targeting juveniles, have also occurred on Tompkins Creek. Except in the case of obvious barriers to anadromous fish, snorkel surveys generally do not make distinction between small resident trout and steelhead due to the impossibility to differentiate the two; and larger sizes are also rarely separated. Electroshocking occurred in 1988 and 1989 to track juvenile fish abundance and biomass (USFS 1989). Steelhead/rainbow trout snorkel surveys were conducted in 1989, 1990, 1996-1998, and 2005 with fish found in all years. Finally, fish observed during an ocular survey in 1978 were not identified as to species, but were most likely steelhead/rainbow trout.

In February 2013, the District Fish Biologist walked approximately 1.0 miles upstream Tompkins Creek beginning at the corral in order to examine general habitat condition. A redd search was concurrently conducted, but none were seen. However, the survey may have been a bit early to expect fish in Tompkins Creek most years, as seen when examining positive spawning survey dates from the 1980s. A follow-up redd survey in April observed three steelhead and two resident rainbow trout redds.

*CalFish query performed on 3/25/2014

- No live/dead fish or redd counts available
- Steelhead distribution maps do include Tompkins Creek

Unpublished data and/or field notes from: 1980-1986, 1988- 1992, 1996-1999, 2002, 2013

U.S. Forest Service (USFS). 2006. Habitat utilization by juvenile Coho salmon in selected tributaries of the Scott River, 2005. Report prepared by Northern California Resource Center for Klamath National Forest, Scott River, Fort Jones, CA. 31 pp + appendices.

U.S. Forest Service (USFS). 1998a. Juvenile fish survey – Tompkins Creek. Unpub. data.
U.S. Forest Service (USFS). 1998b. Fish census dive 1997-1998 – Tompkins and Kelsey Creek. 7 pp.
U.S. Forest Service (USFS). 1989. 1989 Juvenile steelhead electroshocking population survey (Tompkins Creek, Siskiyou County). 2 pp.
U.S. Forest Service (USFS). 1978. Stream survey – Tompkins Creek. Unpub. data.

Tyler Meadow Creek – Steelhead/Rainbow Trout Surveys

Resident rainbow trout are present in Tyler Meadow Creek, but steelhead are not. A survey quantifying distribution of various fish species in the Grider Creek and its tributaries was conducted in 1981, with resident rainbow trout observed in Tyler Meadow Creek (Kucas 1981). Approximately 0.3 miles of the creek was considered to be suitable habitat.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Steelhead distribution maps do not include Tyler Meadow Creek

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Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

Scott River – Steelhead/Rainbow Trout Surveys

Steelhead and resident rainbow trout are present in the Scott River in the general project area, with a focus on the reach between Scott Bar and Middle Creek. Specifics concerning suitability of the river in this location for spawning is poorly known due to often hazardous discharge conditions which are present in spring. However, the rotary screw trap operated by the CDFW annually records downmigrating smolts in the spring (Daniels, *et al.* 2011); and the video weir upstream of Indian Scotty Campground regularly captures movement of fish in the fall and early winter (Knechtle and Chesney 2014). Finally, dive investigations into the presence/absence of summer steelhead occurred 2007 through 2009, with adults and/or half-pounders recorded each year within deep pools of the Scott River adjacent the Project (QVIR 2010).

*Location restricted, where possible, to general Project area (Scott Bar to Middle Creek)
*CalFish query performed on 3/25/2014

- See project record for expanded datasets referred in summary
- No redd counts available
- Steelhead distribution maps include the Scott River in the Project area

Live/Dead Fish Count

- CalFish records available (2): 90360, 91034
    - Inclusive years (all datasets): 1992-1997
- Summary: Steelhead recorded in 1994, 1995, 1997
- Note: specific locations not provided, but often mouth to Fort Jones

Other – Weir Operations (near mouth)

- CalFish records available (2): 90420, 90421
  - Inclusive years (all datasets): 1982-1985, 1987, 1989- 1991
- Summary: Steelhead recorded all years

Daniels, S., Debrick, A., Diviney, C., Underwood, K., Stenhouse, S., and W. Chesney. 2011. Final report Shasta and Scott River juvenile salmonid outmigrant study, 2010. Report #P071307. California Department of Fish and Game, Northern Region, Yreka, CA. 97 p.

Knechtle, M., and D. Chesney. 2014. 2013 Scott River salmon studies final report. California Department Fish and Wildlife, Northern Region, Yreka, CA. 23 p.

Quartz Valley Indian Reservation (QVIR). 2010. 2007-2009 summer steelhead, spring Chinook, and Pacific lamprey dive surveys, Scott River, CA. Quartz Valley Indian Reservation, CA. 16 pp.

Grider Creek – Steelhead/Rainbow Trout Surveys

Steelhead and resident rainbow trout are present in Grider Creek. In total, steelhead occupy about 12.2 miles of Grider Creek mainstem, and resident rainbow trout 14.6 miles. The upstream extent of steelhead and rainbow trout is likely due to a combination of discharge, steep gradients, and/or barriers.

Large-scale fish distribution surveys of the Grider Creek drainage, including its tributaries, were first conducted in 1981 (Kucas 1981), and again in 1988 (Clearwater BioSciences 1988). Both resident rainbow trout and steelhead were found throughout the drainage during the surveys, with an 8 foot waterfall barrier described upstream of the Rancheria Creek confluence. While the waterfall was believed to be a barrier to Coho and Chinook (the former has since been found above), it was thought to be passable by spawning steelhead given an appropriately high water discharge.

Various types of fish surveys have been conducted most years 2002 through 2012. Except in the case of obvious barriers to anadromous fish, surveys which focus upon juveniles do not make distinction between small resident trout and steelhead due to the impossibility to differentiate the two; and larger sizes are also rarely separated. In the 2002-2013 survey period, steelhead/rainbow trout were incidentally reported during Coho presence/absence surveys and fall Chinook spawning surveys; and were specifically targeted during summer steelhead and general fish presence/absence surveys. For all years, steelhead and/or resident rainbow trout were observed.

A summer steelhead census that occurred in 1982 did not see fish, although the report did note that steelhead had been observed in the past (CDFW 1982). One summer steelhead was observed during a fish survey in 1981 (Kucas 1981). More recently, summer steelhead surveys have been conducted most years 2001 through 2013, with fish regularly observed.

Specifics concerning use of the creek for spawning is poorly known due to often hazardous discharge conditions which are present in spring, as well as snow creating access difficulties.

Redds and live fish were observed during steelhead spawning surveys conducted in 1989 and 2002.

*CalFish query performed on 3/25/2014

- See project record for expanded datasets referred in summary
- No redd counts available
- Steelhead distribution maps include Grider Creek

Live/Dead Fish Count

- CalFish records available (2): 90583, 90907
    - Inclusive years (all datasets): 1969, 1982, 1998, 2001-2005
- Summary: Steelhead seen 1969, 2001, 2002, 2004, 2005

Unpublished data and/or field notes from: 1989, 2002-2013

California Department Fish and Wildlife (CDFW). 1982. Siskiyou County spring run king salmon and steelhead inventories – 1982. 6 pp.

Clearwater BioSciences, Inc. 1988. Fish habitat characteristics and salmonid abundance in the Grider Creek drainage during June 1988. Prepared for Klamath National Forest, P.O. # 40-91W8-8-1572. 18 pp + appendices.

Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

Klamath River – Steelhead/Rainbow Trout Surveys

Steelhead and rainbow trout are present in the Klamath River in the general project area, with a focus on the reach in the vicinity of Hamburg. Specifics concerning suitability of the river in this location for spawning is poorly known due to often hazardous discharge conditions which are present in spring. However, surveys for steelhead juveniles during the summer do find utilization at tributary confluences and thermal refugia (Belchik 2003).

*Location restricted to general Project area (Hamburg vicinity)
*CalFish query performed on 3/25/2014

- No live/dead fish or redd counts available
- Steelhead distribution maps do include Klamath River

Unpublished data and/or field notes from: 2002-2012

Belchik, M. 2003. Use of thermal refugial areas on the Klamath River by juvenile salmonids, summer 1998. Report in fulfillment of Grant #8-FG-20-17510. Yurok Tribe. 36 pp.

Critical Habitat for Coho Salmon (and) Essential Fish Habitat for Coho/Chinook Salmon

Designated Critical Habitat (CH) for Coho salmon encompasses accessible reaches of all rivers (including estuarine areas and tributaries) between the Mattole River in California and the Elk River in Oregon, inclusive (May 5, 1999, 64 FR 24049). The area described in the final rule represented the current freshwater and estuarine range of Coho salmon. Land ownership patterns within the Coho salmon ESU analyzed in this document and spanning southern Oregon and northern California are 53% private lands; 36% Federal lands; 10% State and local lands; and 1% Tribal lands. The Forest Service manages about 1,680,000 acres (90.6%) of land within the Forest boundaries and about 200,000 acres (9.4%) of land are within the Forest boundaries but in other ownership (LRMP, Page 3-12). Essential Fish Habitat (EFH) is considered for both Coho and Chinook salmon, with consultation occurring under 305 (b) (4) (A) of the Magnuson-Stevens Fishery Conservation and Management Act. The definition of Coho/Chinook EFH components and extent is described by Amendment 14 (Appendix A, pages 12-35 [adopted year 2000]) of the 1978 Pacific Fisheries Management Council Salmon Fisheries Management Plan.

Conclusions regarding CH and EFH occurrence are based on field review of habitat suitability, professional judgment, District fish survey records, and California Department of Fish and Wildlife (CDFW) information. In general, the KNF Coho Presence (GIS) layer defines CH, and Coho or Chinook distribution (whichever is of maximal extent) defines EFH. As appropriate, the California state information in Calfish.org may also be utilized. Where information on Coho or Chinook is lacking (e.g., no/few surveys have been completed), else it is the professional judgment of the Fish Biologist that neither KNF nor Calfish.org range maps fully capture CH/EFH extent, the KNF Steelhead Trout Distribution (GIS) layer may be used as a proxy for maximum range of anadromous fishes. This dataset is recognized as a conservative approach for assessment of effects to anadromous fish habitat because Coho and Chinook salmon may not occupy the same waters as steelhead due to differences in jumping abilities. The maximum jumping height (under ideal conditions) for Coho is 2.2 meters; Chinook salmon is 2.4 meters; and steelhead is 3.4 meters (Meehan 1991). Therefore, steelhead trout can access more habitat than Coho or Chinook salmon (i.e., steelhead trout can make a 3-meter jump to migrate up a stream, but Coho and Chinook salmon cannot.). Additionally, differences in spawn timing may also affect actual distribution. As an example, steelhead spawn in the spring, encountering higher discharge conditions than Chinook, which spawn in the fall. In consequence, Chinook may be denied access to streams, or segments thereof, due to the presence of low-water barriers that are passible to steelhead during spring flows.

In all cases, field review and site-specific surveys may refine the location of CH or EFH.

Maps A-7 and **A-8** show the distribution of CH and EFH the Action Area and Analysis Area. This map is based on fish distribution with site-specific changes made per professional fisheries biologist knowledge, stream surveys, or CDFW data. Field review, survey history, and CalFish.org agree that Coho presence is appropriately reflected by the existing Forest Service map database for the Project area. Extensive fish surveys have occurred in both Grider Creek and Tompkins Creek, defining Coho distribution. Therefore, Coho distribution (and, thus, CH) will not follow steelhead distribution in the Project area, instead utilizing the Klamath National

Forest and CalFish.org maps. Elsewhere in the Project area, barriers, such as those at the mouth of Middle Creek, low stream discharge, and/or steep gradients lacking pool habitat control distribution of Coho and other anadromous fish, both adults and juveniles. Since the extent of Coho is greater than that of Chinook, Coho distribution will also define EFH for the Project area.

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Available online: http://www.swr.noaa.gov/salmon/MSRA_RecoveryPlan_FINAL.pdf

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